Super Graphix™ Gold

The Ultimate Printer Interface for Commodore® Computers

by Xetec

INSTRUCTION MANUAL

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits of a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residental installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4.

Xetec Super Graphix *Gold* owner's manual
Written by Marty Flickinger

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SuperGraphix *Gold* Utility disk copyright © 1987
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Commodore 128 and C-64 are trademarks of Commodore Business Machines

Super Graphix *Gold* Addendum

Power-up Sequence

The recommended power-up sequence using the Super Graphix *Gold* with your system is as follows:

Printer
Interface
Computer

Note that you can turn them all on simultaneously, but turning the computer on before the interface can cause a system lockup on some computers.

Using Geos with your *Gold* Interface

Geos will not work with an interface that communicates in the *FAST* mode. You can force the Super Graphix *Gold* to work in the SLOW mode with the following commands:

```
OPEN 15,4,15
Print#15,"SL"
```

The Super Graphix *Gold* will stay in the slow mode until it is shut off or a 'cold' reset is performed (RESET/CLEAR).

Amendments to your Manual

Make the following changes to your Super Graphix *Gold* manual:

Page 10, 1st paragraph under **The Font Enable Switch:**
change A7 on line 3, to A8

Page 23, **DT** and **DA** commands: append a ,S ,R or ,U to the command to access SEQ, REL, and USR file types, respectively. For example: DA:testfile,S

Page 25, table: under **Commands**, *F#n* should be just *Fn*.

Page 48, Section 16—Directory Download:
Between **1 byte** and **? byte** insert: **2 bytes** Lo/Hi Length of file

Page 50, 2nd paragraph:
S0, S1, S2 should read B0, B1, B2

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INTRODUCTION

The Xetec Super Graphix Gold printer interface for the Commodore family of computers is the most powerful device of its type to date. It combines the best features of previous interfaces and some brand new features never before seen. Congratulations on your choice!

Super Graphix Gold Features

- Disk included - contains utilities, sample programs, fonts, and pictures
- 32K buffer
- 8 switch-selectable operating modes
- 20 secondary addresses
- 32 printer settings
- 4 internal screen dumps
- 4 high quality fonts built in - 4 more downloadable from disk
- All 8 fonts support underlining, bold-facing, italicizing, superscripts, subscripts, double-height, proportionality, and 12 print pitches.
- Command channel (more than 52 commands)
- Supports fast serial from C-128 computers
- Direct-from-disk download and dump capabilities
- Correct graphics/text ratio for all major printers
- 16 Active switches with changes constantly monitored
- Switch settings on label for quick reference
- RESET and CLEAR buttons
- LED indicates activity and errors

Your new interface may soon be printing things like:

This is the near letter quality font
This is another *internal* font
This is a downloaded font

The engineers at Commodore chose to design their own printer and communications format instead of adhering to standards already set. What this means to you, the computer owner, is that you have two options if you want a printer: to buy a Commodore printer (or one that acts like it), or buy a standard parallel printer of your choice and purchase an interface to connect it to your computer. Obviously, you have chosen the latter solution. Thank you, and congratulations.

An interface for a Commodore computer must perform at least two jobs. First, the signals coming from your computer must be converted from Commodore serial format to Centronics parallel. Second, the data must be converted from Commodore (PETSCII) to the standard format (ASCII). PETSCII is a name given to Commodore's way of numbering the printable characters.

This second operation is called **ASCII conversion**. You will see that term often throughout this manual. If you send text from a Commodore computer and have the ASCII conversion in the interface shut off, wierd results appear: lower-case text prints as capitals and capital letters print as italics or other graphic characters.

You will soon find that the SuperGraphix *Gold* can do far more than these two simple operations. Almost all of its extra features can be turned on or off at your discretion. The majority of this manual is dedicated to explaining how to select the desired features, and what effect each feature has on the data passing through the interface.

One other thing the *Gold* does to the data is buffer it. You've heard a lot of talk about buffering, but just what is it? The *Gold* puts all data it receives from the computer into an area of RAM within the interface — the buffer. As quickly as the printer will accept data, that information is retrieved from the RAM buffer and sent to it. This tends to "smooth out" the spurious data into a constant stream of data, thereby pushing the printer to its peak of efficiency. A large enough buffer (like 32K), also allows the computer to transmit its data in a much shorter time span, because it's being held in the buffer (which accepts data faster than any printer). Once the data transmission is complete, the computer is free to go on doing other things while the interface is still patiently waiting for the printer to print the remaining data.

Now, an even faster improvement is available exclusively on the SuperGraphix *Gold*: When tied to a 128 or 128D computer, the interface automatically coaxes the computer into sending all data in a **fast serial** format. Until now, only disk drives could do this. Fast serial transmission is about twice as fast as the normal speed. And just to ice the cake, these same two computers, when used with a special driver (included, see page 52), can **burst** transmit data at about 9 times the normal rate!

USING THIS MANUAL

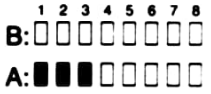
We have made every effort to make this manual easy to follow without neglecting any of the interface's many powerful features. If at any point you get stuck, look for a sample program (they are boxed in for your convenience) or read the text again. Don't get discouraged if it just doesn't make sense. Come back to it later and it may be much clearer. Some parts of this manual cover advanced features of the *Gold* that are not easy to understand, so **do not expect to master the interface right away**. Any time you run into a problem, flip to Appendix A, page 55 and see if your problem is listed in the left column of the table. The right-hand column lists the most likely cause or causes for each of the problems listed.

Most users will only need to concern themselves with parts of the manual. Generally, the manual progresses from easy topics at the start to more complex ones near the end. Beginners should initially avoid the section from

pages 46 to 54, as they deal with topics only useful for, and only safe in the hands of, experienced computer users.

Switches

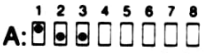
Throughout this manual, reference will often be made to the 16 DIP switches visible through the top of your interface. For your convenience, a diagram will be included, whenever possible, to help you locate the switch or switches being discussed. For example, if the 3 mode switches are being discussed, the following diagram would show which switches they are:



All the diagrams will be shown horizontally like this, which is the way the switches appear if you look at the interface from the left (so that the words around the switches are readable). If switches are to be set a specific way, the diagram will show dots on the switches, on the end that should be pushed:

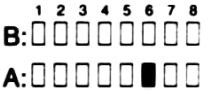
Those switches left blank do not apply in that example, and should therefore be left alone.

Occasionally, when space is critical, only one row of switches will be shown. For example the switch settings shown in the example above might be shown this way:



The "A" to the left of the switches is important because it tells you which row of 8 switches is shown. The "A" bank is the bottom set (or the left set if looking at the interface straight-on). A "B" denotes the "B" bank which is the top (or right) set.

To prevent cluttering the manual, when switches are mentioned in passing we will refer to them by description instead of using a diagram. The numbers 1 through 8 are clear enough on the switches themselves, so the only other description needed is which bank of 8 the switch is in. For example, if we refer to switch A6, that would be this switch:



THE SUPER GRAPHIX GOLD DISK

The included disk contains various programs and data that might be helpful in using your interface. The disk includes at least the following:

GOLD DEMO — Demonstrates some of the capabilities of the interface
CREATE — Creates and edits your own fonts (use in C-64 mode)
CREATE128 — Create fonts in the 128 mode on an 80-column monitor
SWITCHES — Program to help you set the interface switches
FEATURES — Program to display and alter current interface options
COMMANDS — Program to help you when using the command channel
SPEED DEMO — Compares the speed of the Gold to other interfaces
HS – GOLD — Program to convert Hot Shot fonts to the Gold format
SG – GOLD — Program to convert SuperGraphix fonts to the Gold format

Fonts and pictures ready for you to use

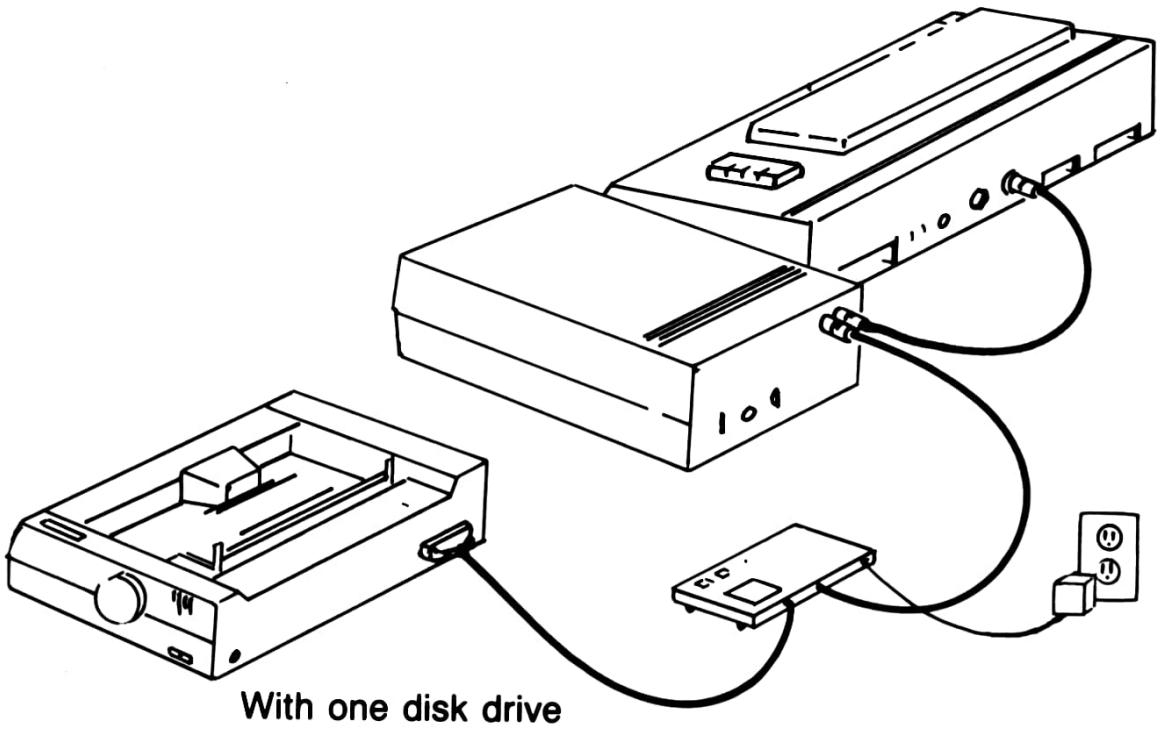
For details on using each of these programs, see "**The Utility Disk**," page 44.

SETTING UP THE INTERFACE

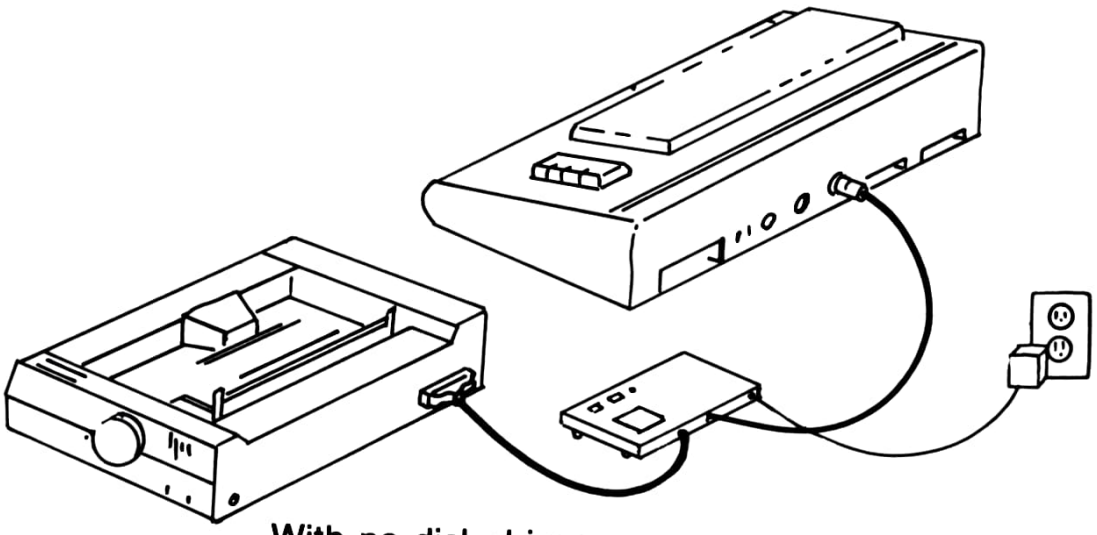
Before you can try using any of your interface's special features you need to connect it properly to the rest of your system. Refer to figure 1 as you follow these steps:

- Turn off your printer, computer, and disk drive if you have one.
- For now, make sure all 16 switches on the interface are in the 'off' position:

- Plug the short cable coming out of the printer interface into the connector on the back of your printer. Make sure it's pushed in all the way. If your printer has clips on the sides of the connector, lock these into place to keep it from coming loose.
- **If you do not have a disk drive:** Plug the round connector (on the end of the long cable) into the serial port at the center of the backside of your computer. (The connector won't fit into anything but the serial port.)
- **If you have a disk drive or two:** Leave the disk drive plugged into the computer. Plug the round connector on the end of the long interface cable into the empty connector on the back of your disk drive.
- Insert the plug from the wall adaptor into the power jack on the Super Graphix *Gold*. Plug the adaptor into a wall socket (120VAC).



With one disk drive



With no disk drives

Fig. 1 Setting up the interface

GETTING YOUR FIRST PRINTOUT

Now that you have your system all connected properly (we hope), you need to turn the whole thing on. The order in which you turn your equipment on is not crucial, but we do recommend that you turn your printer on before the interface (via the wall adapter). If your whole system is on a junction box or light switch, you should have no problem powering up everything at once.

You are now ready to see what this new device you bought will do. Since we haven't discussed the interface switches yet, set them all off except for B1:

Be sure to type the following lines exactly as they are shown, ending each one with a RETURN.

```
OPEN 1,4
PRINT#1, "IT WORKS"
```

If you got a ?SYNTAX ERROR, you typed something incorrectly. If nothing printed, go back through the set-up steps and make sure you followed every one correctly. If you get the same results the second time, consult appendix A on page 55 for help.

Before you can proceed with any of the nifty stuff, you have to take care of a little business. The interface needs to know what kind of printer it's hooked to. Right now it knows enough about your printer to print "IT WORKS" and that's about it. The next section describes how to let it know all about your particular printer.

SETTING THE INTERFACE SWITCHES

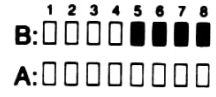
The 16 DIP switches on the interface control how it operates. Four of the switches tell the interface what kind of printer you have. The other 12 select different printing modes or other options. This section will tell you how to set the switches right now, and which ones you might want to change later.

At this time, let's point out that unlike DIP switches on other devices (like other printer interfaces, printers, etc.), the switches on the Super Graphix *Gold* are **active**. Basically, this means that if you flip a switch, the interface sees that change and immediately puts it into effect. No longer do you have to turn the interface off then back on to register the change. Just flip and go!

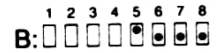
On the back of this manual is a summary of all the switch functions. Sections for correctly setting each group follow:

Setting the Printer Type

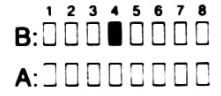
Switches B5, B6, B7, and B8 must be set for your particular printer. Look through the following list for your printer and use the settings listed next to it to set the 4 switches shown.



PRINTER	SWITCHES
Axiom GX–100	B:
Banana	B:
Blue Chip M120/10	B:
Blue Chip M150/10, M150/15	B:
BMC 80, 100	B:
Cal–Abco Legend	B:
Cannon PW–1080–A	B:
C-Itoh 715f	B:
C-Itoh 8510	B:
C-Itoh 8510 s/sc	B:
Daisy–wheel printers (all)	B:
Delta 10, 15	B:
Diablo P10i, P12, P32	B:
Epson MX–80	B:
Epson LQ series	B:
Epson (all other models)	B:
Gemini 10	B:
Gemini 10X, 15X	B:
IBM Graphics Printer	B:
NB24–10	B:
NEC 8023	B:
NX–10, NL–10, NP–10	B:
Mannesmann Tally Spirit 80	B:
Mannesmann Tally MT160/180	B:
Mannesmann Tally MT1600/1800	B:
Okidata, 82A, 83 with Okigraph ROMs	B:
Okidata 84, 92, 93	B:
Okidata 192, 193	B:
Panasonic KX–P1080, 1080i, 1090i, 1091, 1092, 1093	B:
Pinwriter P6, P7	B:
Prowriter	B:
Radix 10, 15	B:
Riteman	B:
SD–10, SD–15	B:
Siekosha GP–100	B:
SG–10, SG–15	B:
SR–10, SR–15	B:
Non-Graphic printer	B:

If your printer isn't listed, try  since it is the most common setting.

Also associated with your printer choice is switch B4:

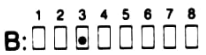


Use it to tell the interface if your printer has a normal or wide carriage (normal ▫ 80 column, wide ▪ around 132).

Once you set these five switches, you will probably never need to change them unless you change printers. So once they are set, forget about them.

The Device Number

All devices connected to the computer's serial bus (such as printer interfaces and disk drives) are given their own device number. Printers are usually given a device number of 4. If you have a second printer, it is usually called device 5. Switch number B3 tells the interface which device number to use:

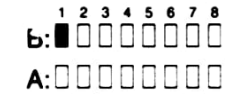
Device #	Switch
4	
5	

Unless you have two interfaces connected at the same time, you should set yours to device 4 by shutting switch B3 'off'.

Auto Line Feeds

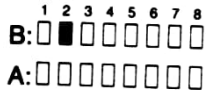
When the computer is printing data to the printer and it wants to start a new line, it sends what is called a "carriage return" which literally means to return the carriage (or head) of the printer to the left side. But since a new line is to be started, the paper also needs to be moved up a line or the next line will overprint the first.

The auto line feed is a code sent from the interface to move the paper up a line each time the computer sends a carriage return code. You can turn this function on or off with switch B1:



To make things more complex, most printers have a switch that will allow the printer to do the same thing. If you turn on the auto line feeds on both the printer and the interface, you will get everything double-spaced. You will have the most success if you turn on auto line feeds on the interface, and shut them off on your printer (refer to your printer's manual).

For added flexibility, you can tell the interface to ignore auto line feeds that come from the computer. This can be useful because some software always sends auto line feeds and gives you no way to shut them off (which makes font printing difficult). Now you have control. This option, called **line feed stripping**, is selected with switch B2:



Take note that this option will only remove a line feed code which follows a carriage return. All other line feed codes are processed as usual.

With these two switches, you can control auto line feeds coming into the interface (B2) and those going out the interface (B1).

The Mode Switches

At this point, you should have all the switches in the 'B' bank set properly. With a few rare exceptions, most users can now forget about these switches and concentrate on those in bank 'A.' They will be the ones you will most often change to achieve different printing results. First let's look at switches A1, A2, and A3 which set the interface's *mode*.

Switches (1 2 3 4 5 6 7 8)	Mode
A: ■ ■ ■ □ □ □ □ □	1525 Emulation
A: □ ■ ■ □ □ □ □ □	Gold mode
A: ■ □ ■ □ □ □ □ □	SuperGraphix mode
A: □ □ ■ □ □ □ □ □	ASCII conversion
A: ■ ■ □ □ □ □ □ □	Hex monitor
A: □ ■ □ □ □ □ □ □	Decimal monitor
A: ■ □ □ □ □ □ □ □	Semi-transparent
A: □ □ □ □ □ □ □ □	Transparent

Let's briefly describe what each of these modes does (for a detailed discussion, see 'A Closer Look at the Operating Modes,' p. 31).

- 1525 Emulation – This mode makes your printer act exactly like Commodore's 1525 printer (except, perhaps, for being faster).
- Gold mode – This mode is close to the 1525 emulation mode, but it allows you to do a few more things (such as getting more readable BASIC listings and sending special control codes to your printer).
- SuperGraphix mode – This mode is very similar to the Gold mode with a few subtle differences. If you are familiar with this interface's forerunner, the SuperGraphix, then you can use the interface in this mode without having to learn to much about it. Not all of the *Gold*'s new features, however, are available in this mode.

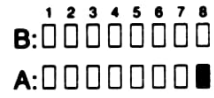
- ASCII conversion (pronounced ASK–EEE) – In this mode text in the Pet ASCII format is changed to text in the standard ASCII format (the one your printer uses). All other codes go right to your printer unchanged. For more info on Pet and standard ASCII, see appendix E on page 60.
- Hex monitor – When in this mode, the values of all data sent to the interface are printed in hexadecimal on the printer.
- Decimal monitor – In this mode, the values of all data sent to the interface are printed in decimal on the printer.
- Semi-transparent – This mode passes all data straight through to your printer *unless* you have turned a font on, in which case the data sent is printed using the font with no ASCII conversion (data sent to the interface should be true ASCII already).
- Transparent – In this mode, every code goes right through the interface to the printer unchanged (as in a transparent piece of glass). There is one exception—switches B1 and B2 still give you the ability to add, strip, or ignore auto line feeds passing through the interface. For absolute, 100% transparency, set both these 2 line feed switches off as well.

Later, you will be instructed which mode to use in what situation, but for now remember this: if you are printing from BASIC, you will most likely want to use 1525 emulation, Super Graphix, or Gold modes. If you have no idea what you need, use the Gold mode.

The Font Enable Switch

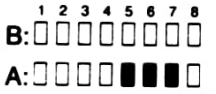
Normally, your interface's only concern when printing text is to adjust the Commodore ASCII (coming from the computer) to standard ASCII (going to your printer). By simply turning switch A7 on, however, the *Gold* interface will intercept that text and print it using one of 8 fonts. This operation increases the print quality of the text as well as allowing you to choose the appropriate type style.

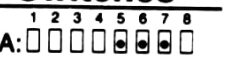
The drawback to printing using fonts is that it is much slower than printing text normally. Use this switch wisely to minimize your waiting: when printing a document, print a test copy with this switch off, then, when you're sure it's perfect, print your final copy with this switch on.



The Font Select Switches

Switches A5, A6, and A7 select the font you want to use. Notice that to use fonts at all, you must enable them by turning on switch A8 (see above). Later, you will learn how to pick the font using software, but for now, use these switches.

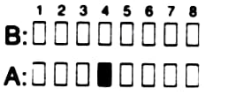


Font	Switches
NLQ	
Helvetica	
Broadway	
Script	
User 1	
User 2	
User 3	
User 4	

The first 4 of these fonts are always present in your interface. They can never be changed. The last 4 are undefined at first, but using simple commands (later), you can install any of the fonts on the included disk into the interface for subsequent use. These fonts are temporary; they can be changed as often as desired and remain in place as long as the interface is on (unless you choose to remove them). You will find that they do persist for a while even if the interface is shut off, but if left off long enough, they eventually disappear. You will learn how to load fonts into these 4 in **Downloading Fonts**, page 37.

The Enhance Switch

A major trade-off that must be made when printing is quality vs. speed. The SuperGraphix *Gold* gives you hands-on control of that choice with switch A4:

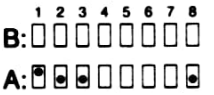


When turned off (enhanced mode off), the interface, any time it has a choice, will pick the fastest method to print something. If the switch is on, it will pick the best-looking method of printing. Commodore graphics characters and font characters are two items that print noticeably different depending on the setting of this switch. Try printing some both ways to see which you prefer. Of course, you can always change the switch any time you want.

Well, that about raps it up for the DIP switches. Remember that a summary of all the switch functions is printed on the back cover for easy reference.

PRINTING GRAPHICS

Since you had to sit through all that stuff about switches and modes and things, it's time to do something a little more exciting. Select normal text printing and set the mode to "Gold:"



Now, let's see some graphics characters printed:

```
OPEN 1,4                [remember to hit RETURN]
PRINT#1,"♥♥♥♥"          [To get ♥, hold shift and push S]
CLOSE 1
```

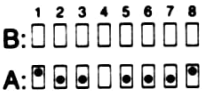
Four hearts should have printed. If you get a bunch of garbage, check to see that you have the printer type switches and the mode switches set correctly.

☞ NOTE: If you have set all four of the printer switches to 'on' (the setting for daisy wheel printers), graphics characters cannot be printed.

Now try some other graphics characters or maybe mix text and graphics on the same line.

PRINTING USING FONTS

If you're ready, we will begin to explore the font capabilities of your interface. First, select the NLQ font and the Gold mode:



Then type the following lines (in this example, to get the lower case letters just type the letter; to get the capitals, hold shift and type the letter):

```
open 1,4,7
print#1,"This is the NLQ font. Wow!"
close 1
```

☞ NOTE: If the text was printed in standard dot matrix, your printer may not be capable of printing fonts (not all are). Check the chart on page 16 for details.

Change switches A5, A6, and A7 to something besides NLQ and repeat the example. (Hint: if you don't execute the third line, you can repeat the 2nd one as many times as you want.) If you try to print using any of the four user

fonts, you will see your basic NLQ font because the interface knows they are as yet all undefined. You will learn how to load fonts to these 4 settings a bit later.

THE CLEAR AND RESET BUTTONS

The SuperGraphix *Gold* has two recessed pushbuttons that may occasionally be useful to you. If you have ever started a printout, only to notice that you forgot to pick the right interface mode, or there's no ribbon in the printer, etc., you know how valuable it is to be able to clear an interface's buffer. This is a problem especially on the *Gold* because it has such a large buffer (32K); you could wait seemingly forever for 32,000 characters of an incorrectly sent file to empty out (not to mention the paper/ribbon waste). If you ever want to abort a printout, your first step should be to stop the computer from sending data if possible. Otherwise, you'll have to keep emptying the buffer until the computer stops on its own. To clear all data currently waiting in the buffer to be printed, just press and release the **CLEAR** button. The printer should stop printing soon thereafter (depending on the amount of buffer in the printer—to clear it too, just shut the printer off).

The CLEAR button also has another use. If you hold it for more than a second before releasing it, the interface will print its status on the printer:

SuperGraphix Gold by Xetec, Inc. [Rev x.x] Interface status:

Mode	Font	Enhance	Printer	Width	Device	Linefeed	Buffer
Gold	On: NLQ	No	Gemini 10X	80	4	Yes	30976

To summarize, if you press the button and hold it more than one second, you get the status printout; shorter than one second, the buffer is cleared.

The **RESET** button can be used as a general panic button. It resets the interface to the way it would be if you just turned it on, *except:* If you have downloaded any fonts or a picture into the interface, they remain. All modes and options, however, are set back to their defaults. This is called a *warm* reset. To accomplish a *cold* reset, press RESET then CLEAR within a second of each other. Your printer will beep to signal a cold reset has taken place (if it recognizes 7, the BELL code). A cold reset is more thorough than a warm one in that it also wipes out any fonts or picture that had been downloaded. It's the same as turning the interface on after being off a while (hence the term "cold").

Since pressing RESET passes on a reset signal to most printers, you can use it to clear any data or options sent to the interface and printer.

Since the SuperGraphix Gold has its own power supply, you can reset or shut the computer off without affecting the interface at all. With a slight hardware modification, however, you can make the interface and printer reset whenever you reset the computer. For those qualified, see **Hardware Modifications**, page 51.

THE ACTIVITY LED

Peeking through the top of the SuperGraphix *Gold* is a red LED with the label "ACTIVE." This LED (Light Emitting Diode) will give you a window into the activities of your interface.

Usually, it is lit when data is being received from the serial bus. Data sent at normal serial speed causes a medium-bright glow on the LED. Frequently, you can see the "sputtering" of data because the LED erratically blinks and flashes. When fast serial data is sent (128 & 128D computers), it will be obvious because the LED will glow extra brightly, and will be very steadily lit.

This same LED is also used to reflect that an error has occurred. It does this by steadily flashing (just like the light on a disk drive). Don't worry about confusing this with the flashing caused by slow serial data. The two look completely different. Let's cause an error so you can see it:

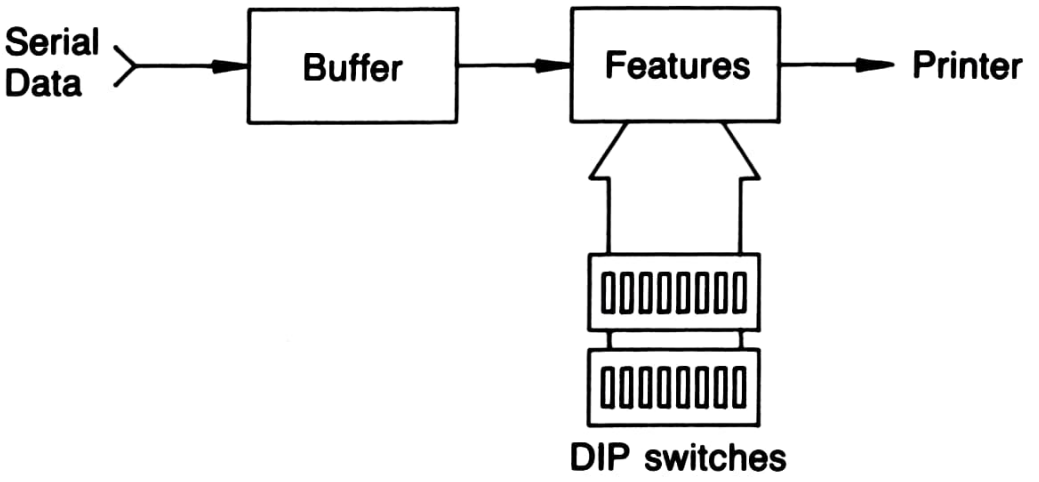
```
OPEN 1,4,15
PRINT#1,"!"
```

When you press RETURN after the second line, the LED will blink for just an instant when the command is transmitted, then the error blink will begin as soon as the command is detected to be illegal.

There is another type of error the *Gold* can display. If something so serious goes wrong that the interface can't recover, it will display a slow blink (about 1 per second). If this ever occurs, you can't read the command channel for more info. In fact, you won't even be able to talk to the interface in any way. The only way out is to RESET the interface. The occurrence of an error of this type should be reported to Xetec.

THE BUFFER

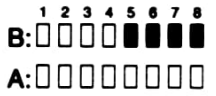
Throughout this manual, references are made to the buffer. Just what is the buffer? Actually, in the Super Graphix Gold the buffer is the collective name for 3 areas of RAM in the interface that help it print faster and do other amazing things. If you visualize the interface like the diagram below, you will have no trouble mastering it.



Notice that immediately after data comes out of the buffer, it passes through the "features" logic of the interface, then on to the printer. Most of the interface's DIP switches are used by the "features" to determine just what to do with the data. The most important point of the diagram is the relationship of the switches to the buffer: the switches (and associated features) are applied to the data, not when it's sent to the interface, but when its ready to be printed. Consequently, you can change DIP switch settings as data is printing and see the results almost instantly.

YOUR PRINTERS LIMITATIONS

Unfortunately, not all printers are capable of printing everything the Super Graphix *Gold* will do. Refer to the chart below to see what will and won't work with your printer (based upon how you set switches B5 thru B8).



Switches	Graphics?	Fonts?	Superfonts/ Compressed?
B:	YES	YES	POOR
B:	YES	YES	GOOD
B:	YES	YES	POOR
B:	YES	YES	GOOD
B:	YES	YES	GOOD
B:	YES	NO	NO
B:	YES	YES	POOR
B:	YES	YES	POOR
B:	YES	YES	POOR
B:	YES	NO	NO
B:	YES	YES	GOOD
B:	YES	YES	POOR
B:	NO	NO	NO
B:	NO	NO	NO
B:	NO	NO	NO
B:	NO	NO	NO

USING WORD PROCESSORS AND PRE-PACKAGED SOFTWARE

This section deals with getting your interface to print correctly with software that you have purchased (especially word processors). The next section will show you how to communicate with the interface in programs that you write.

Let it be said that this section in no way attempts to help you make a program print that isn't designed to. If that is your intention, you will need to read **Automatic Screen Dumps** on page 42 or **Printing From BASIC** (next) if you want to do some modification. The intent here is to teach you how to take software that has some provision for printing (be it text, pictures, or whatever) and use it and the interface in such a way that you get the desired printout correctly.

There are basically two types of software you will encounter. First, there are those programs that ask you what printer you have, either with a menu (e.g. Easy Script) or with loadable printer files (as in Paper Clip). To make these programs print right, you can do one of two things:

- Tell the program you have the Commodore printer (it may go under the names 1525, CBM, or PET). Then set the interface in the 1525 Emulation mode ( ) and all should work. You have the option of printing

normally or with fonts (using switches A5 thru A8). This set-up will usually limit you to just printing text or graphics. If you want to do some things like underlining, superscripts, etc., you should use the other set-up:

- If your printer is one of the options listed in your software (or your printer is compatible with one), select that printer and set the interface in the semi-transparent mode (A: 1 2 3 4 5 6 7 8). You have the option of printing normally or with fonts (switches A5 thru A8). Whatever you select, all features such as underlining, pitches, superscripts, etc. should work. For more information on these things, see the section on **Escape Codes** starting on page 33.

The second type of software you might run into never gives you any chance to select the type of printer you have. 99.9% of the time this means it is written for the 1525 printer. This type of software is easily made to work with the interface: just set the interface to the 1525 emulation setting (A: 1 2 3 4 5 6 7 8) and select normal text or fonts (with switches A5 thru A8).

PRINTING FROM BASIC PROGRAMS

If you intend to write or modify BASIC programs that will use your printer, you will need to become familiar with four BASIC commands that allow you to talk to the printer. They are 'OPEN', 'CLOSE', 'PRINT#', and 'CMD'. Let's take a look at each one at a time.

• The **OPEN** command must be used to open a channel to your printer before you can print data to it. It's about the same as dialing someone's number before you can talk to them on the phone. The format for the OPEN command is as follows:

OPEN C,D,S

- C — Channel number. This can be any number you choose from 1 to 127. Whatever number you pick, you will use it later when you actually print data (you are just preparing to at this point).
- D — Device number. This tells the computer what device you will be sending the data to. Your interface is probably device 4 or 5, depending on how switch B3 is set. Four is the one normally used.
- S — Secondary address. This number can be left off (then it would be OPEN C,D). If used, this number tells the interface what to do with the data you will be sending it. Different numbers here allow you to access the different features of your interface and printer. All the legal secondary addresses and what they do will be introduced on page 19.

OPEN 1,4	Opens channel 1 to the interface
OPEN 23,4,7	Opens channel 23 to the interface with secondary address 7

• Once a channel has been 'OPEN'ed to your interface, the **PRINT#** command is used to actually send data to it (from there it goes to your printer and then gets printed). The format of this command is:

```
PRINT#C, "Your data to be printed goes here"
```

C — Channel number. This is that number from 1 to 127 that you picked in the OPEN command. You have to supply this number because more than one channel can be open at once, so you have to tell which channel to print through.

"Your data to be printed goes here" — This is where you put the data you want printed. This part is the same as in a regular PRINT command (except it goes to the printer).

```
PRINT#1,"I WANT THIS PRINTED"
PRINT#23,"THE ANSWER IS";A
```

• The **CLOSE** command is used to undo an OPEN command. You don't have to close a channel until you are done sending all the data you want. The format is simple:

```
CLOSE C
```

C — Channel number that you chose in the OPEN command. This tells the computer exactly which channel to close (remember, more than one channel can be open at once).

CLOSE 1	Closes channel number 1
CLOSE 23	Closes channel number 23

• The last of the four BASIC commands is **CMD**. This command tells the computer to send all data to a channel instead of the screen. This is especially useful for listing BASIC programs or disk directories to the printer. Here's how you would do it:

OPEN 1,4	You must open a channel first
CMD 1	Send everything to channel 1
LIST	List the program to the printer
PRINT#1	Send things to the screen now

There are ways to make the interface list programs in different forms. For details, see **Listing BASIC programs** on page 27.

SECONDARY ADDRESSES

Now that you are familiar with the OPEN command, it's time to let you know some of the options you can choose by using different secondary address numbers (the "7" in OPEN 1,4,7). Here is a list of the legal ones and what they make the interface do.

Secondary Address	Interface Function
0	Upper case text and graphics
1	Upper case text and graphics with no auto line feeds sent
2	Upper case fonts and graphics
3	Hex dump. All data sent is printed in a debug mode
4	Transparent. All the data you print goes directly to the printer regardless of the mode switches.
5	Transparent. Same as 4 except no auto line feed is sent.
6	Transparent except that text is printed in fonts.
7	Upper/lower case text and graphics.
8	Upper/lower case text and graphics with no auto line feeds.
9	Upper/lower case fonts and graphics
10	Decimal dump. All data sent is printed in a debug mode
11	Font downloading (the old SuperGraphix method)
12	Hi-Resolution dump
13	Lo-Resolution dump
14	Banner channel (or U/L case text screen dump)
15	Command channel. Instead of text to be printed, you send commands to the interface with this sec. address.
16	Directory channel
17	Picture channel

Secondary Address	Interface Function
18	Font channel
19	User channel
20 +	If you add 20 to any of the above numbers (0 thru 10 only) the interface will be 'locked' in that mode. See the section on **Locking the Interface** (p.29)

Let's look at the secondary addresses (frequently called S.A.'s throughout this manual) in groups.

First, the group from 0 to 10 are for sending text. They do a variety of different things to it. Addresses 3, 4, 5, and 10 are unique because they override the mode and features selected by the DIP switches and command channel. S.A. 5, for example, ensures absolute transparency so is frequently used to send custom graphics directly to the printer. The others in this group are commonly used when printing text.

Secondary addresses 11 through 13 are primarily for compatibility with software written specifically for the SuperGraphix. You can still use these if you want (see pp. 47 and 48), but the same things can be accomplished more simply now and with more options using some new *Gold* commands.

S.A. 14 is rather unique. If the mode switches (A1—A3) are set to "SuperGraphix," then it acts just like '14' on the SuperGraphix which is an Upper/lower case text screen dump. Like 11—13, this is for compatibility only and can be accomplished other ways. If the mode switches are set to anything else, then S.A. 14 is a banner channel. Any text or graphics characters sent to it are printed in 8" high letters running sideways on the paper in any font of your choice. All font effects (underlining, italics, boldface, etc.) work in banners as well.

S.A. 15 is very important to the *Gold*. Text sent to this **command channel** is interpreted as commands instead of printable text. There is a whole section dedicated to the use of this channel starting on page 21.

Secondary addresses 16 through 19 are used by the interface itself for downloads. You can use these channels, too, but it's involved. When you're ready, you can find out the details of these channels under **Format of the Download Channels** on page 47.

THE ERROR CHANNEL

Another feature found exclusively on the *Gold* interface is an error channel. You may be familiar with the disk drive's error channel; the interface's works similarly. Include something like the following to read the error channel from BASIC:

```
OPEN 15,4,15
INPUT#15,A,B$
PRINT B$
```

The 2nd line loads the variable 'A' with the error code and B$ with the error message. Reading the error channel clears the error condition from the interface's memory; the LED will stop flashing. If you read the error channel when no error exists, you will get a code 0 which reads "OK." When the interface is first turned on or reset, the "OK" message is replaced by a code 1 which reads "SG GOLD REV x.x BY XETEC." Subsequent reads will return an "OK." (Sounds familiar, doesn't it?)

There is another way to read the error channel if you own a 128 or 128D. In the monitor you can read the disk drive's error channel by just typing @ and RETURN. This will also read the *Gold*'s error channel if you type a "4" after the "@" (or whatever you have chosen as the device number of your interface).

If you're really paying attention, you should have noticed that to read the error channel, you must use a secondary address of 15, which is supposed to be the command channel. Well, when you send data to S.A. 15, it's the command channel; when you read data from it, it's the error channel. Commodore designed their disk drives this way, so we've followed their example for your convenience.

A list of all the possible error messages and codes appears in Appendix B, page 56.

THE COMMAND CHANNEL

As a review, different secondary addresses in the OPEN statements cause the interface to do different things with the data it receives. A very special case is secondary address 15 which is called the command channel. Unlike any other channels, the command channel looks at the data you send as commands, not stuff to be printed to the printer. The commands it recognizes select different options and some really special things. First, let's see how to use this channel, and then all of the commands will be described.

```
OPEN 1,4,15      Notice the Sec. address of 15
PRINT#1,"I"      The 'I' command is sent
```

If you got a ?FILE OPEN ERROR on line 1, type CLOSE 1 (RETURN) then try the two lines again.

When you get it to work, a short message (called the Identification) should be printed. That's what the 'I' command does - it identifies the model and revision of the interface you have.

Many people make the following mistake when they first try to use the command channel. Can you see what's wrong?

```
OPEN 1,4,15
PRINT#1, "I"
PRINT#1, "THE COMMAND WORKS!"
```

The error above is that the last line is supposed to print "THE COMMAND WORKS!" to the printer. What will happen, however, is the interface will look at it like a 'T' command, an 'H' command, an 'E' command etc. because you are sending it to the command channel. If you want to send commands and print text, do something like this:

```
OPEN 1,4,15
OPEN 2,4,7
PRINT#1, "I"
PRINT#2, "THAT'S MUCH BETTER!"
```

With most of the commands, there is another way to mix commands and text. You can send a command through a channel opened for printing as long as you precede it with two ESC codes (decimal 27). So the example in the box above could also be done this way:

```
E$=CHR$(27)
OPEN 2,4,7
PRINT#2,E$;E$;"ITHAT'S MUCH BETTER!"
```

Notice that as soon as the "I" is interpreted, the *Gold* goes back to looking for text characters (until another double-ESC is sent). This ability can be useful for sending commands from software that gives you no ability to have two separate channels open at once. The following commands **do not work with double-ESC** codes: **E, R, U,** and all **commands starting with "D".**

There is a total of 60 different commands that your command channel will recognize. Here they are, each with a brief explanation. For your convenience, an abbreviated list of the commands appears in Appendix Q on page 76.

Most will be described in more detail in sections dealing with their function. Symbology: "xxxx" represents a filename and *n* stands for a number. For example, **SA3**, **SA14**, and **DT:myfile** are all legal commands.

- U — Unlock the interface. This will undo an "LK" lock or one that was forced by a secondary address of 20 or more.
- I — Print the interface's identification.
- E — Empty the buffer
- M — BASIC listings—control codes: mnemonic mode
- V — BASIC listings—control codes: video mode
- G — BASIC listings—graphics codes: graphic mode
- A — BASIC listings—graphics codes: ASCII mode
- K — BASIC listings—graphics codes: keystroke mode
- LK*n* — Lock interface's secondary address to *n*. Until the interface is reset or unlocked, this S.A. is used, no matter what the computer requests.
- LF*n* — Set auto line feed mode to *n* (0 thru 3). They are as follows: 0-None, 1-Add auto, 2-Strip one, 3-Strip one and add auto.
- #*n* — Set interface device number to *n*. Example: "#5"
- F#*n* — Select device # of disk drive used for downloads. Example: "F#9"
- W*n* — Set the print width to *n* columns. Example: "W80"
- X*n* — Select the international character set (0 — 9). See page 38.
- ST — Print status report (just like holding down the CLEAR button)
- QR — Print a quick reference showing the valid secondary addresses
- C0 — Width compensation off
- C1 — Width compensation on
- Q0 — Disables listing mode (cannot list BASIC programs)
- Q1 — Enable listing mode again
- R — Release all RAM for use as buffer (and empty the buffer)
- 128 — Using C-128 computer (with slow serial cable)
- SA*n* — Set the auxilliary sec. addr. to *n* (for banners, directories, and download)
- D$ — Download directory from disk and print it using the auxilliary secondary address (the one set with the SA*n* command)
- D$:xxx — Download directory from disk using pattern matching and print it using the auxilliary secondary address
- DT:xxxx — Download text file from disk and print it using secondary address 4
- DA:xxxx — Download text file from disk and print it using the auxilliary secondary address (the one set with the SA*n* command)
- DC — Download customizer file from disk (created by "FEATURES" program). The file read is "GOLDCUSTOM"
- DCxxx — Same as "DC" except specifies a specific customizer file. The file read is "GOLDCUSTOMxxx"

- DP:xxxx Download a 40-column picture from disk and hold until later
- Pzzzz Select picture options. If picture has been downloaded with "DP", also starts mixing the picture with text
- SP Stop picture mixing prematurely
- DO:xxxx Download 40-column picture from disk and print immediately (using options set by the Pzzzz command)
- DW:xxxx Download 80-column picture from disk and print immediately (using options set by the Pzzzz command)
- YP Recover RAM used by picture (add it to buffer)

- F*n* Select font to use for printing (1 — 8). Example: "F5"
- FS Select font as set on DIP switches A5 thru A7
- N1 Fonts enabled (on)
- N0 Fonts disabled (off)
- DN*n*:xxxx Download a normal font from disk to font number *n*
- DS*n*:xxxx Download a super font from disk to font number *n*
- ?xy Master selection of font effects (see p. 36)
- OT*n* Set line-to-line spacing to *n* increments while using fonts
- OL*n* Set underlining offset to *n* increments while using fonts
- 6 Set spacing to 6 lines/inch while using fonts
- 8 Set spacing to 8 lines/inch while using fonts
- SU With fonts: underline spaces as well as text
- SB With fonts: leave spaces blank between underlines words
- BT Align normal characters with bottom of talls
- TP Align normal characters with top of talls
- H1 24 wire printers: shorten characters by 30%
- H0 24 wire printers: character shortening off
- YF Recover RAM used by downloaded fonts (add it to buffer)

- B0 No banner smoothing
- B1 Some banner smoothing
- B2 Extra banner smoothing
- BG Leave gaps between chunks in banner
- BC Connect all chunks in banner
- BW Double-width banner
- BN Normal-width banner

More than one command can be sent at one time. For example

```
OPEN 1, 4, 15
PRINT#1,"UI"
```

would unlock the interface and print the identification. If an illegal command is sent, the interface's LED will flash to signal an error. See **the Error Channel**, page 21.

☞ Some of the commands prohibit other commands from being placed on the same line. **U**, if used, must be the 1st character in the command string. You may, however, follow it with other commands. All download commands, in other words all commands starting with "D", must be the only command in the string. You may not preceed them or follow them with any other commands unless they have their own "PRINT#".

COMMANDS VS. SWITCHES

You may have noticed that some interface features are selected by both DIP switches and commands (be it command channel or escape commands). The selected font is a good example; it is chosen with DIP switches A5 — A7 or with "F#n" to the command channel. This offers the best of both worlds, because the user can easily get to the option with the switches, and software can get to it using the command.

What happens, however, when these two sources disagree? No Sci-Fi fans, the interface doesn't catch fire. Basically, it's a "tug-of-war" between the switches and commands (both teams having the same strength). In other words, if you send a command selecting an option, the interface heeds it. Then if you change the switches controlling that same option, the interface then uses the switch setting. The "opinion" most recently stated is the one used by the interface. Keep in mind this only applies to the few features whose state is selected by switches *and* commands:

Feature	**Switches**	**Commands**
Font selected for printing	A5,A6,A7	F#*n* ESC *n*
Fonts enabled or disabled	A8	?xy N1 N0 ESC *n*
Line feed mode	B1,B2	LF*n*
Device number	B3	#*n*
Printer width	B4	W*n*

Also, it is important to note that any of these options set by software is overridden by the DIP switch setting only when you change a switch concerning that option. In other words, if you set the device number to 5 with software, you can flip any DIP switches you want and the device number will stay at 5 *until you make a change on switch B3.*

THE CONCEPT OF DOWNLOADING

One of the most unique and interesting things the *Gold* can do is download information from a disk drive. This means that the interface (on your command) will talk directly to a disk drive and fetch the desired information from it without involving the computer. This is possible due to the interface's unique circuitry. In fact, it's intelligent enough to know what kind of disk drive it's talking to, which means it can download data in slow serial (if using a 1541, for example) or in fast serial (if using a 1571 or 1581). The *Gold* supports 10 different types of downloads, all started by sending command channel commands:

COMMAND	FUNCTION
DT:*filename*	Get a text file and print it using sec. addr. 4
DA:*filename*	Get a text file and print it using the auxilliary secondary address set by the "SAn" command
D$	Download and print the disk directory
D$:*pattern*	Download and print the disk directory using the given pattern (i.e. D$:TEST*)
DO:*filename*	Download a picture and print it immediately
DW:*filename*	Download an 80-column picture and print it
DP:*filename*	Download a picture and hold it for printing later
DN*n*:*filename*	Download a normal font to user font *n*
DS*n*:*filename*	Download a super font to user font *n*
DC	Download the customizer file "GOLDCUSTOM"
DC*more*	Download a specific customizer file. The name is "GOLDCUSTOM" with *more* on the end.

All these commands must be the only ones on the line. In other words you can't PRINT#1, "W132D$" or even PRINT#1, "MDT:TEST2".

If something goes wrong with a download operation (you sent an illegal parameter in the command, no disk drive is present, the file could not be found on the disk, etc.), the interface will flash its LED. If you don't know what you did wrong, read the interface's error channel for an explanation (see page 21).

When attempting to download a file, the *Gold* normally looks on the disk drive that has a device number of 8. You can specify a different floppy device number like this:

```
OPEN 1,4,15
PRINT#1, "F#9"
```

All subsequent downloads will then take place from device 9.

☞**CAUTION** — There is a danger when letting the interface download data from a disk: in Commodore's scheme of things, the computer is the "master controller." No other device was ever foreseen to have enough intelligence to be able to "run things." The computer, therefore, is not smart enough to know that someone else is using his serial bus. What this boils down to is that if you start the interface downloading, then use the serial bus in any way before the interface is through, the computer and interface will probably "lock up," requiring resets on both. You can avoid this problem by visually watching for the interface's LED to go off. When this happens, you are clear to LOAD, SAVE, PRINT#, etc.

There are also several ways to automatically wait until the interface is through—syncronizing, or **sync**ing for short. Such methods are absolutely necessary if you want to write software that performs downloads (for how can a program watch the interface LED?!?). Remember that using one of these techniques is your responsibility, the computer is naive in this area. For instruction about how to sync to the interface through software, see **Syncronization** on page 46.

LISTING BASIC PROGRAMS

As was shown before, the way to list a BASIC program or disk directory is as follows:

```
OPEN 1,4
CMD 1
LIST
PRINT#1
```

Graphics characters and control codes (such as cursor movements) can make a BASIC listing hard to read, especially if someone has to enter the program from the listing. To alleviate this problem, several different ways of listing graphics characters and control codes are available for you to use.

In the 1525 emulation mode, control codes will be listed as they look on the screen (a reverse heart, for example). In the "Super Graphix" or "Gold" modes, however, control codes can also be listed in what are called **mnemonics** (pronounced NEW-MONICS). The mnemonic for clear screen is [CLR]. It's easier to recognize and remember than an obscure graphic character. The **M** and **V** commands when sent to the command channel will specify which mode you would like them listed in (M for mnemonics or V for Video method). Remember, however, that in the 1525 emulation mode, the V (video) method is the only one that can be used.

By default, the interface lists graphics characters as they look on the screen, but they can be listed two other ways:

- Keystrokes. If you send **K** to the command channel, the keystroke mode is selected. Keystrokes show what key presses produce that character. For example, a ♠ is listed as [SS] which means SHIFT- S while ◥ is listed as [C*] meaning C= *
- ASCII values. If you send **A** to the command channel, the ASCII listing mode is turned on. In this mode, graphics characters are listed like this: [176].
- Graphics. The **G** command will return the listing mode to 'graphics'.

Example: To list a program using mnemonics and keystrokes:

```
OPEN 1,4              Open a text channel
OPEN 2,4,15           Open command channel
PRINT#2,"MK"
CMD 1
LIST
PRINT#1
```

LISTING DISK DIRECTORIES

With the SuperGraphix *Gold*, there is a way to print the directory of a disk without loading it into memory (and therefore without destroying whatever you have in memory). Here's how this is done:

```
OPEN 1,4,15
PRINT#1, "D$"
```

This causes the interface to fetch the directory from the disk drive and to print it. The text in this printout follows the same rules as for the text that you would print from the computer, which means you can turn fonts on, select font effects, etc.

You can also specify a pattern for the files you want listed, just like you can with the disk drive. For example, to list a directory of all fonts on a disk:

```
OPEN 1,4,15
PRINT#1, "D$:?/*"
```

LOCKING THE INTERFACE

In some circumstances you may want to 'lock' the interface into one of the secondary addresses listed on page 19. **Locking** means that no matter what secondary address is used, the S.A. that was locked will override it. There are two ways to lock the interface to a certain secondary address.

First, you can open a channel with 20 added to the desired secondary address and print something. This method can only be used with S.A. 0 thru 10. Here's an example:

```
OPEN 1,4,27        (Lock in sec. address 7)
PRINT#1            (Complete the lock)
```

Another way to lock the interface is using the command channel:

```
OPEN 1,4,15
PRINT#1, "LK14"
```

In this example, the interface is locked into S.A. 14.

TAB

Avoid using the TAB function in PRINT# statements. If you must use it, print your data through a channel *that does not send auto line feeds* (ones with secondary addresses of 1, 5, or 8). Consequently, every time you want to start a new line, you must send a line feed yourself – CHR$(10). This example should clear all this up.

```
10 REM TAB EXAMPLE
20 OPEN 1,4,8
30 PRINT#1,TAB(5)"20TH"
40 PRINT#1,TAB(20)"20TH"
50 PRINT#1,TAB(10)"10TH"
60 PRINT#1, CHR$(10):REM GO TO NEXT LINE
70 CLOSE 1
```

PRINT WIDTH

In the context of this manual, what is meant by the print width is how wide the interface thinks the printer is. For example, if you have a 132 column printer but your interface's width is set to 80, you won't be able to go beyond the 80th column (the interface thinks that's all there is).

In the 1525 emulation mode, the width is fixed at 80 and there is no way to change it.

In the "SuperGraphix" and "Gold" modes, the width is initially set by the printer width switch (B4). If 'off,' the width is 80; if 'on,' 132. This is just a starting value. You can set it to anything you want using the command channel **Wn** command. Here's how that would look:

```
OPEN 1,4,15
PRINT#1,"W25"
```

Change the 25 to whatever width you want. If you specify a width of zero, the width becomes infinite (is never checked).

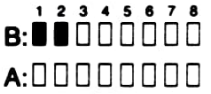
In all other modes, the width function is not applicable. In these modes, your printer will start a new line when it is incapable of printing any farther.

☞ When printing fonts or graphics, the width is strictly followed. When printing normal text, however, the interface lets the printer decide when to start a new line. The reasoning behind this is that in some printing modes (compressed, for example), the printer can fit more than 80 characters in 8 inches. No assumption therefore is made; the text is just passed through.

LINE FEEDS

When the computer is printing data to the printer and it wants to start a new line, it sends what is called a "carriage return" which literally means to return the carriage (or head) of the printer to the left side. But since a new line is to be started, the paper also needs to be moved up a line or the next line will overprint the first.

Depending on the two line feed control switches and the secondary address being used, the interface will or will not send an auto line feed after each carriage return. In fact, in some cases it will remove line feeds that come from the computer. The following chart shows when to expect what:



– Line feed removed
+ Line feed added

Switches	Secondary Address 0	1	2	4	5	6	7	8	9
B: 1 2 3 4 5 6 7 8									
B:	+		+	+		+	+		+
B:	–	–	–	–	–	–	–	–	–
B:		–			–			–	

Remember that wherever there's a "–", a line feed is removed only if it follows a carriage return. All other line feed codes are processed as usual.

A CLOSER LOOK AT THE OPERATING MODES

This section gets a little more technical but more specific about the operation of the eight modes the interface can be placed in. Don't worry if they make no sense to you. You can use the modes without actually knowing what they are doing. But the details are here, just in case.

1525 Emulation mode

This mode acts just like the 1525 printer. This means that the optional listing modes (ASCII, keystrokes, and mnemonics) will not work. Also, you cannot send special codes to your printer because the interface will block them in the emulation mode. The print width is held at 80 characters no matter how wide your printer is or what you set the width to. PET ASCII is of course converted to standard ASCII. You *can* use fonts in this mode.

Gold mode

In this mode, just about everything that the interface will do is enabled including all the listing modes, ASCII conversion, fonts, and adjustable print width. Also, any codes that don't correspond to 1525 functions will be passed on through to the printer in case it will recognize it. The interface watches the "escape codes" you send and will act upon them. Escape codes that the interface understands may or may not be passed on to the printer; the *Gold* decides. The interface understands a different set of escape codes, depending on which printer is selected on DIP switches B5 thru B8. See Appendix G (page 62) for a list of the escape codes for each.

SuperGraphix mode
This mode is almost identical to the Gold mode, with the following exceptions: the same set of escape codes is recognized, no matter how the interface's printer type switches are set (see Appendix G, table "SuperGraphix"). This is how the SuperGraphix interface acts. Also, in this mode, data sent to secondary address 14 is not printed in banner form, but is regarded as data for an upper/lower case text screen dump (since that what S.A. 14 does in the SuperGraphix interface).

ASCII conversion mode
In this mode, nearly all features of the interface are turned off except for the command channel and the conversion from PET ASCII to standard ASCII. Fonts and any font effects may be used, if desired. This mode is recommended for use with the 128 or 128D in the CP/M mode.

Hex Monitor mode
In this mode, the printer prints the hexadecimal value of all data the interface receives. Use this to help you debugging software or any time you want to know what codes are being sent from the computer. You can also access this feature by using secondary address 3. If you don't understand hex values, then don't use this mode—use the decimal monitor mode.

Decimal Monitor mode
In this mode, the printer prints the decimal value of all data the interface receives. Use this to help you debugging software or any time you want to know what codes are being sent from the computer. You can also access this feature by using secondary address 10.

Semi-transparent mode
In this mode, no ASCII conversion takes place, and no Commodore graphics characters can be printed. Auto line feeds are still controlled by the switches B1 and B2, and fonts can still be switched on if desired.

Transparent mode
This mode is completely transparent. Other than auto line feeds, which are still controlled by switches B1 and B2, all codes come in, are buffered, and go out. Period! No ASCII conversion takes place, no secondary addresses have any function, and fonts cannot be used.

CUSTOMIZERS

With the multitudes of options and features available with the SuperGraphix *Gold*, you are bound to eventually settle on preferences that you wish you didn't have to painstakingly set every time you turn the interface on. The *Gold* gives you a way to accomplish this—called customizer files.

This is how it works: you must load and RUN the program on the utility disk called "FEATURES". First, use menu selections 1 thru 5 to set the interface exactly the way you want it. When everything is set, pick "6" from the menu to create a customizer file. Now insert a disk that will hold the file. Then type the device number of the drive you put the disk in (8, for example) and press RETURN. Now you are asked to enter an optional customizer identifier (name). Unless you are going to save more than one different customizer files, just type return; otherwise enter up to six characters to uniquely identify this file. The file will then be written.

After that, any time you want to restore the interface to that condition, make sure that disk is in the drive and send this to the command channel:

```
OPEN 1,4,15
PRINT#1, "DC"
```

to load the generic customizer file (called "GOLDCUSTOM" on the disk) or:

```
OPEN 1,4,15
PRINT#1, "DCname"
```

to load the customizer with the indentifier "*name*."

Both of these will fetch the file directly from the disk and restore the interface just as it was when the file was saved.

ESCAPE CODES

Escape codes are sequences of codes that you send to your interface or printer which are not printed but select certain options (very similar to the command channel, but sent right along with the text to be printed). All escape codes must start with the escape character (27). Here's an example of an escape code sent within a line of text:

```
PRINT#4,"NOW IT WILL CHANGE  ";CHR$(27);"GTO BOLD"
```

The escape, CHR$(27), tells the printer and the interface that the next code sent (the 'G' in this case) is an escape command. The escape G (or ESC G) for most printers turns on the boldface mode.

Listing the escape codes that the *Gold* recognizes is a little awkward because first of all, there are many of them. Second, the codes recognized change depending on what printer type is set on switches B5 thru B8. If the reason for this isn't clear, think for a minute about this scenario: you are going to

be printing with a word processor, using various special effects (like compressed, italics, underlining, etc.). The interface must understand the same codes your printer does, or you will get different results when fonts are on than when they're off. For this reason, the *Gold* has a unique list of escape codes for every printer setting.

There are some escape codes that are always good, no matter what printer is selected. These codes (and the command channel) should be used whenever possible (because they are so universal). These "standard" escape codes, since not understood by your printer, will not be passed on to it; they are exclusively for the interface.

Standard Escape Codes

Sequence	Codes	Effect
ESC *I* 1	27 201 1	Turn italicizing on
ESC *I* 0	27 201 0	Turn italicizing off
ESC *P* 1	27 208 1	Turn proportional on
ESC *P* 0	27 208 0	Turn proportional off
ESC *S* 0	27 211 0	Set pica pitch (10 cpi)
ESC *S* 1	27 211 1	Set alternate pitch (11 cpi)
ESC *S* 2	27 211 2	Set Elite pitch (12 cpi)
ESC *S* 3	27 211 3	Set connect pitch
ESC 1	27 1	Select NLQ font
ESC 2	27 2	Select Helvetica font
ESC 3	27 3	Select Broadway font
ESC 4	27 4	Select Script font
ESC 5	27 5	Select user font 1
ESC 6	27 6	Select user font 2
ESC 7	27 7	Select user font 3
ESC 8	27 8	Select user font 4
ESC 9	27 9	Select dot matrix

The italicized capital letters in the "sequence" column should be entered by holding SHIFT with the letter. Letters in escape codes are not true text, so no ASCII conversion is performed on them. The majority of escape codes are shown with capital letters (e.g. ESC A). These letters are entered without SHIFT held. This may seem confusing, but that's the way it's been with Commodore interfaces. Italicized escape codes (like in the list above), are to be entered with SHIFT held, too. Lowercase escape codes (ESC p 0) are the hardest to enter — you can't enter the "p" inside quotes, but must send its value shown in the "codes" column. So, for "p" you would have to send CHR$(112).

The specific escape codes for each printer setting are listed in Appendix G starting on page 62. Remember that in the "SuperGraphix" mode, the first table shown is always used — "SuperGraphix escape codes." Also, the standard escape code list is not used in this mode.

These escape codes are only functional under certain conditions. Any of the following will prohibit their functioning:

a) The mode is set to Hex monitor, Decimal monitor, or Transparent

b) Use of secondary address 3, 4, 5, or 10

c) When fonts are disabled (by switch A8 or software commands)

As long as fonts are enabled and conditions 'a' and 'b' are not true, then both the standard escape codes and the unique escape codes are functional.

Escape Code Priority

The *Gold*'s escape codes fall into three levels of priority. They are

Commodore codes
Unique escape codes
Standard escape codes

If the same code appears in more than one of these groups, the one of highest priority (highest on this list) is used. For example, the code 18 (not really an escape code, just 18) is a Commodore code meaning "turn on inverse printing." For most printers, it's also a unique code saying "shut off compress." Since Commodore codes are of higher priority than unique escape codes, the inverse printing command is accepted.

The top group, Commodore codes, is listed in Appendix C on page 56. These codes are only functional if the interface is set to one of the first three modes: 1525 emulation, Gold, or SuperGraphix.

PRINTING WITH FONTS

There are several ways to cause fonts to be used when printing through the interface. You can physically turn switch A8 on to enable fonts. Or you may use the command channel (N0, N1, ?) to turn fonts on or off. Use of secondary addresses 2, 6, or 9 will also enlist the use of fonts.

Keep in mind, however, that if the printer type switches are set to a printer that can't do fonts, or if the mode is set to "transparent," you will never be able to turn fonts on.

Much effort has been spent to make your interface/printer combination act the same when printing fonts as when printing dot matrix. This is more difficult than it would seem because when using fonts, the interface is in control; printing dot-matrix, the printer is in control.

On the other hand, your printer will not be able to do everything in dot-matrix that the *Gold* will do when printing fonts. Following is a discussion of the effects that can be used when the interface is printing fonts.

FONT EFFECTS

Since SuperGraphix *Gold* fonts are actually bit-image graphics sent from the interface to the printer, the effects can be achieved with them is limited not by the printer, but by the interface. Maybe 'limited' isn't the best word, for 10 different effects can be applied to fonts. This equates to over 1,100 combinations per font style! These effects are

Boldface on/off
Italicize on/off
Proportional on/off
Expand on/off
Compress on/off
Pitch (character spacing) – 4
Tall on/off
Underline on/off
Superscripts on/off
Subscripts on/off

They can be controlled by the appropriate use of command channel commands and escape codes. Since the escape codes for these effects are different depending on printer selected, most programmers will want to use the font effects "master select" command in the command channel:

```
OPEN 1,4,15
PRINT#1, "?"CHR$(x)CHR$(y)
```

The two values 'x' and 'y' directly set the state of each font effect. The value of 'x' is computed by adding the value shown for each desired effect:

VALUE ADDED	EFFECT
128	Subscript
64	Superscript
32	Underline
16	Tall
8	Compress
4	Expand
n	Pitch (0 = 10 CPI, 1 = 11, 2 = 12, 3 = 13)

The value of 'y' is computed the same way, except using this table of effects:

VALUE ADDED	EFFECT
128	Fonts enabled
32	Proportional on/off
16	Italicize on/off
8	Boldface on/off
n	Font number–1 (0 thru 7)

For those of you familiar with binary, here's the layout of 'x' and 'y':

	7	6	5	4	3	2	1	0
x	Subs	Supers	Uline	Tall	Cmprss	Xpand	--------Pitch--------	
y	Fonts		Prop	Italic	Bold	----------Font----------		

DOWNLOADING FONTS FROM DISK

Of the SuperGraphix *Gold*'s 8 selectable fonts, the first four are always available for use. The last four, however, must contain a font loaded from the utility disk before you can use them. Since these user fonts are loaded into the interface RAM, they will be lost if the interface is shut off long enough.

The printing buffer starts out at almost 32K at power-up, but for each font you load into the interface, the buffer gets smaller and smaller. The **YF** or **R** commands sent to the command channel will release all RAM used by fonts and dedicate it once again to the buffer.

Every user font you define by downloading steals 3,840 bytes from the buffer. If you download a font to all four of the user fonts, then, you say goodbye to over 15,000 bytes.

Unlike other interfaces, with the *Gold* you don't need a program to help you download fonts into the interface. All you have to do is tell the *Gold* what font to get, and where to put it:

```
OPEN 1,4,15
PRINT#1, "DS2:CELTIC"
```

This says "Interface, I want you to **d**ownload a **s**uperfont from disk to user font **2**. The name of the font I want is **celtic**." Likewise, for a normal font:

```
OPEN 1,4,15
PRINT#1, "DN1:BLOCK"
```

When the interface receives such a command, it waits for all data in the buffer to be printed, then looks on the disk for the font requested. If it's found, it will be loaded into the interface RAM and readied for use as a font.

Technical note: Secondary addresses 11 and 18 are set aside solely for the purpose of downloading fonts. They should not be used for the printing of text or the sending of commands. The format for data sent to these channels is documented in **Format of the Download Channels**, page 47.

INTERNATIONAL CHARACTER SETS

Most printers have a group of DIP switches that select what is called the international character set. A handful of characters in the normal ASCII set will be replaced by special characters used in the language selected by these DIP switches. When using fonts, however, these special characters will not appear because the interface is generating the imagery for the characters, not the printer. The interface, therefore, has a set of international character sets for use with fonts. On the *Gold* you must set the international set with software, as no DIP switches are set aside for this purpose:

```
OPEN 1,4,15
PRINT#1, "X2"
```

where the "2" can be any number from 0 to 9. Here are the available sets:

Set	Country	35	36	64	91	92	93	94	95	96	123	124	125	126
0	Commodore	#	$	@	[	£	]	↑	←	—	┼	▒	▌	π
0	USA	#	$	@	[	\	]	^	_	`	{	¦	}	~
1	France	#	$	à	°	ç	§	^	_	`	é	ù	è	~
2	Germany	#	$	§	Ä	Ö	Ü	^	_	`	ä	ö	ü	ß
3	England	£	$	@	[	\	]	^	_	`	{	¦	}	~
4	Denmark	#	$	@	Æ	Ø	Å	^	_	`	æ	ø	å	~
5	Sweden	#	¤	É	Ä	Ö	Å	Ü	_	é	ä	ö	å	ü
6	Italy	#	$	@	°	\	é	^	_	ù	à	ò	è	ì
7	Spain	#	$	@	¡	Ñ	¿	^	_	`	{	ñ	}	~
8	Norway	#	¤	É	Æ	Ø	Å	Ü	_	é	æ	ø	å	ü
9	Denmark II	#	$	É	Æ	Ø	Å	Ü	_	é	æ	ø	å	ü

PRINTING PICTURES

The SuperGraphix *Gold* makes it simple to print a picture from a disk file. In fact, doing so doesn't even disturb a single byte in computer memory!

```
OPEN 1,4,15
PRINT#1, "DO:mypicture"
```

where "mypicture" is the filename of the picture to print. To be printable in this manner, the disk file should be a PRG file of 32 or 33 blocks (directly-loadable image file). This command, therefore, can only be used with pictures make for the VIC chip — in other words, 40 columns wide.

For 80 column picture files (63 blocks), use this command:

```
OPEN 1,4,15
PRINT#1, "DW:mypicture"
```

Both commands look for the picture on disk, and if found, will print it immediately to the printer.

PICTURE OPTIONS

Just as with fonts, pictures are just bit-image graphics sent from the interface to the printer, so the interface can manipulate the data in numerous ways before it passes it on. The *Gold* gives you five picture options that you can select. These can be used in any combination, giving 256 different ways to print the same picture! The command to select these options has the general forms

P*s*
or P*so...*

where *s* is a size code from the following:

CODE	SIZE
Q	¼x
H	½x
P	¾x
1	1x
A	Proportional
W	1.5x
2	2x
B	2x Proportional

"o..." is a list of option codes (in any order) from the following:

CODE	OPTION
1,2,3, or 4	Darkness of picture (4 is darkest)
E	Emphasize picture (solid)
T	Tall — doubles height
N	Negative image

Here are two examples of this command used properly:

```
OPEN1,4,15
PRINT#1, "PH"
```

```
OPEN1,4,15
PRINT#1, "P24T"
```

After sending this command, all pictures printed with the "DO" or "DW" commands will use the options chosen. These options are retained until another such command is sent, or until the interface is reset.

☞ All pictures manually printed via secondary address 12 (the old SuperGraphix hi-res channel), do not heed the options chosen. They are printed just like they did on the SuperGraphix: size of 1x, no options. If you want to manually send picture data but still have the options at your disposal, you will need to study **Format of the Download Channels**, page 47.

MIXING PICTURES AND TEXT

The *Gold* also has the ability to overlay a picture on a block of text. The way this works is you download a picture from disk into the *Gold*'s memory. It doesn't print it immediately, but just holds it until you give the command to start mixing. After that, any text (whether fonts or dot-matrix) that you print will be mixed with the imagery from the picture in memory. Eventually, the whole picture will be used, at which time the mixing automatically shuts off.

First, to download the picture:

```
OPEN1,4,15
PRINT#1, "DP:mypicture"
```

The format for this picture file should be the same as that used with the "DO" command (32 or 33 block PRG file). You cannot download an 80-column picture for mixing.

When the *Gold* receives this command, it waits for all data in the buffer to be printed. It then searches for the picture requested on disk and loads it if found. Once this happens, the print buffer is reduced by 8,000 bytes. Even after the picture is completely mixed with text, it remains protected in memory (you can start another mix if you want). To eradicate it and reclaim the lost memory, send the **YP** command to the command channel. The **R** command will erase the picture and any fonts downloaded.

To start the picture mixing process, all you have to do is send a picture options command (see page 39 for a review). If you just want to start the mixing and not choose any options, just send the command "P" by itself. Also, you can specify a left margin for the picture by tacking on a "-nn" on the end of the picture options command:

```
OPEN1,4,15
PRINT#1, "PH4-10"
```

To stop a picture from mixing before it's complete, send **SP** to the command channel.

MANUAL SCREEN DUMPS

The SuperGraphix *Gold* is equipped with 2 brand new secondary addresses that make screen dumps simple. Programmers can use these channels to let the interface do the "dirty work" part of screen dumps. Both channels accept data formatted only as 40 columns.

Low Resolution

A low resolution screen dump will print all the text and/or graphics characters that are on the screen.

```
10 REM 40-COLUMN LO RES SCREEN DUMP
20 OPEN 15,4,15:OPEN 1,4,13
30 PRINT#15, "SA7"
40 FOR I=1024 TO 2023
50 PRINT#1, CHR$(PEEK(I));
60 NEXT I:CLOSE 1:CLOSE 15
```

Line 30 picks the secondary address to use for the dump. You can use this to print upper/graphics or upper/lower case dumps. Line 40 should scan from the start to end address of the location of the screen memory.

High Resolution

A high resolution dump prints an image made of individual dots instead of characters. Actually, it should be called a memory dump because it prints the picture that is in the hi-res bit map — not necessarily what is on the screen.

The interface accepts 8000 bytes from start to end of the bitmap and transforms it to a form your printer can understand.

```
10 REM 40-COLUMN HI RES SCREEN DUMP
20 OPEN 1,4,12
30 FOR I=8192 TO 16191
40 PRINT#1, CHR$(PEEK(I));:REM NORMAL DUMP
40 PRINT#1, CHR$(255-PEEK(I));:REM INVERSE DUMP
50 NEXT I:CLOSE 1
```

Two line 40's are listed. Use the one that suits your needs.

AUTOMATIC SCREEN DUMPS

The SuperGraphix *Gold* comes equipped with two automatic screen dumps. What is an automatic screen dump? It's a program that is inserted into your computer's operating system. As long as that program remains installed, you can get a screen dump instantaneously with a simple key combination. This allows screen dumps to be obtained even within other programs (as long as they are "friendly" to the screen dump program).

The two programs are simply called **HD** and **LD** for "High Dump" (80 columns) and "Low Dump" (40 column). We'll talk in terms of using **LD**, but if you are using a 128 in the 80-column mode, just substitute **HD** wherever you see **LD**.

First, as was said, you need to install the screen dump program into your computer. Don't look on the utility for the programs because they aren't there. The programs are loaded from the interface just as if you were loading them from a disk drive:

```
LOAD"LD13",4,1
```

You will see the interface LED flicker as the program is loaded. Notice the digits "13"? This tells the interface where you want the program to reside. Yes, you're telling the *interface*. With this value, the interface can modify the routine to work at whatever location you specify, as well as tell the computer where to put it. This process is called **relocation**. The two digits *must* immediately follow the "LD" or "HD" in the filename. Technically, these are

two hexadecimal digits which describe the desired page address of the screen dump. Mathematically, the routine is loaded to the location calculated by the formula:

$$n1 \times 4096 + n2 \times 256$$

where n1 is the 1st digit and n2 is the 2nd. Also, remember that in hexadecimal, the digit A means 10, B means 11, and so on up to F. For example, "LD1E" would load to $1 \times 4096 + 14 \times 256$ or 7680.

Once the program has loaded into memory, you need to activate it. This is accomplished by doing a SYS to the load address calculated from the 2 digits (see above). For the example "LD1E" do a SYS7680.

One other thing the interface does to the program before it lets the computer load it is modify it for the computer you have. It will sense whether you have a 128 or a C-64 and modify the program accordingly. NOTE: if have a 128 but are using a serial cable with the SRQ line cut (known as a "slow serial cable"), the interface will think you have a C-64. If this applies to you, send the command "128" to the command channel so the interface knows what's going on.

For those using a 128 computer (or 128D) in the 128 mode, you can load and install the program in one shot:

```
BOOT"LD13",U4
```

This loads the relocated, adjusted program from the interface and automatically does a SYS to it.

Once the program is loaded and installed, all you need to do to print a dump is hold the C= and CONTROL keys simultaneously. As soon as the interface has accepted all the data, the computer resumes whatever it was doing.

Experimentation will be necessary to find the screen dump locations that work best with different programs.

Creating New Fonts

On the Super Graphix Gold utility disk there is a program called CREATE which helps you create your own fonts or change the ones on the disk. This program runs only on the C-64 (or the C-64 mode). Another program, CREATE128, runs in the 128 mode with an 80-column monitor.

Type LOAD "CREATE",8
or LOAD "CREATE128",8

and when it's loaded, type RUN. You should see the main menu:

1) Create or edit a font
2) Disk commands
3) Exit

We'll start with choice 3 since it's the simplest. This exits the create program. Tough, huh?

Selection 2 will show you a second menu:

1) List all fonts on this disk
2) Erase a font
3) Rename a font
4) Go back to main menu

These are all pretty self-explanatory so push 4 to get back to the main menu. Now let's get to the one you're most anxious to use, selection 1—Create.

When you choose to create a font, the first question you will be asked is if you want to create a normal or super font. Normal font characters are formed from a 9x16 matrix, whereas a superfont uses a 18x16 matrix. Any more, the only drawback to superfonts is they take more disk space. Superfonts and normal fonts both take the same amount of buffer space away, so unless your disk space is at a premium, take advantage of the superfont resolution.

The next question is:

1) Create a new font
2) Edit a font
3) Re-enter edit mode

This gives you three different ways to enter the edit mode. Choice 1 starts you with a font full of blank characters. Choice 2 lets you load a font from disk to work with. Choice 3 just goes to the edit mode without doing anything to the font characters in memory. Use this option if you left the editing mode but forgot to save the font. If you choose option 1 or 2, whatever was in memory will be gone!

Soon a grid should be displayed on the screen. The lines to the right of the grid show which character is being worked on. To define how the character should look, move the cursor (the checkerboard pattern) around on the grid using the cursor keys or a joystick in port 1. Use 'S' and 'R' to set and reset individual dots, or use the fire button to 'toggle' a dot. Use the sample character near the bottom-right edge of the grid to see approximately what your character will look like reduced. If you want to see it on paper for real, press **P** for "print." (Except for **S** and **R**, all commands require that you hold the SHIFT key to work.) You can print the grid of dots in its blown-up form on the printer with the **G** key.

When you are satisfied with the character you have formed, push the **f1** key to store the image in memory and move to the next character. You can skip around without saving characters by using the + – and J keys (J will ask what character to jump to: just push the key).

A time-saving command for creating new fonts is the "get char" key—**f5**. If you press it, you will be asked what character to get. Press the appropriate key and the image assigned to that key will appear in the grid. You can, for example, design the lower case "o" then "get" it to help you draw the letters 'p', 'q', etc.

Notice the two arrows right under the grid. These should always point to the edges of the imagery within the grid. So if the left 3 columns of boxes in the grid are blank, the left arrow should be pointing to the 4th column (the 1st with any imagery on it). These arrows are used when you are using the font with the *proportional* option turned on. In this case, only the stuff from the left to the right arrow is printed. If *proportional* is off, everything in the whole grid is printed. Use the "," and "." keys to move the left arrow around. The same keys with SHIFT held down will adjust the right arrow. The arrow settings are saved and loaded just like the dots in the grid (f1 will remember the dot pattern and the arrow positions).

The remainder of the commands listed at the bottom of the editing screen are obscure enough or self-explanatory enough that they need no explanation. If you don't understand some of them, load a font and experiment.

When you are ready to quit, push **RUN/STOP**. You will be asked what name this should be saved as. If you didn't do anything worth saving, press RUN/STOP again. To save the font, either type the name and RETURN, or just press return to use the same name as the font you loaded. The font will be saved and verified. If the name you pick for this font already exists on the disk, you will be asked if you want to replace this for the old one or not. Press **Y** or **N**.

Font Conversion Programs

Two programs are on the disk for converting fonts from other formats to that of the SuperGraphix *Gold*. **HS–GOLD** converts Hot Shot + fonts to the *Gold*

format. **SG-GOLD** converts fonts from the SuperGraphix to SuperGraphix *Gold* format. The old format can still be used (with a download program and S.A. 11), but only fonts in the *Gold* format can be downloaded directly from disk or edited with CREATE. Both of these program work similarly: from C-64 mode, LOAD and RUN them. The program will prompt you during the conversion process (only one font may be converted at a time).

FEATURES Program

The program on the disk called **FEATURES** is a handy program that helps you program the interface without having to worry about escape codes or the command channel. It also has a menu option that will save the current interface condition to disk in a **customizer file** (see "Gold Customizers" on page 32).

SWITCHES Program

For the ultimate in help when setting the DIP switches on the interface, LOAD and RUN the program called **SWITCHES**. It constantly looks at the DIP switches and displays on the screen what all the settings currently mean. You can watch the info change as you adjust the switches.

SYNCHRONIZING FROM SOFTWARE

Any time a download command is issued to the command channel, the computer must stay off the serial bus until the *Gold* is finished talking to the disk drive. You can tell when the interface is through, because its LED will go off and stay off. When a download command is issued from a program, however, a way is needed for the program to sense when the interface is done (so it can proceed with other serial action). You, the programmer, must take this responsibility or system lockups will result.

In BASIC, just include the following subroutine. After you send a download command, GOSUB to it to wait for the interface to finish:

```
1000 FOR ZZ=1TO30:IF(PEEK(56576)AND192)<>192THEN1000
1010 NEXT ZZ:RETURN
```

For machine language programmers, there is a short routine that can be loaded from the interface that will accomplish the same thing as the BASIC subroutine above. To load it into memory:

LOAD "SYNC",4,1 (If on a C-64)

or

BLOAD "SYNC",U4 (If on a 128)

The program loads at $0140 (decimal 320) to $0162 (decimal 354). Just **JSR** to $0140 or **SYS** to 320 to wait for the interface to complete a download. When control is returned to you, it's safe to use the serial bus. There is also a way, with this routine, to check the interface's activity without dedicating the computer to waiting until it's through: **JSR** to $0148 or **SYS** to 328. When control is returned to you, location $0147 (decimal 327) contains a flag: 0 means the interface is finished, anything else means it's still downloading.

FORMAT OF THE DOWNLOAD CHANNELS

The SuperGraphix *Gold* has several secondary addresses that, although completely accessible, are really intended for use only by the interface itself (the interface, when downloading, retrieves data from disk and passes it into itself picking the appropriate secondary address).

If you know how to use these special secondary addresses, you can do some really interesting things. Following is a discussion of each "download channel" and how to use it.

11 — SG Font Download

This secondary address is the same as that on the original SuperGraphix interface. It is documented here, although it is only included to be upward compatible with software written for that interface. This channel is used to send the imagery of a font to the interface. Downloading the font in this manner allows the interface to use it just like the built-in fonts. Note that only fonts of the SuperGraphix format can be downloaded with this channel. See S.A. 18 for other formats. Also, only user fonts 1 and 2 can be defined with this channel.

1st byte Number indicating font being loaded
1 = User 1, 2 = User 2, 3 = right half of user 1 superfont
4 = right half of user 2 superfont

864 bytes Font pass 1 images (9 per character)

864 bytes Font pass 2 images (9 per character)

All 1729 bytes must be sent before the interface considers the font to be loaded.

16 — Directory Download

This secondary address is used by the interface when you download a directory from disk. The printed directory lines produced by this channel are printed using the auxilliary secondary address (set with the SAn command).

2 bytes Ignored

Repeated for each line of directory:

1 byte Ignored

1 byte Send value of 1 (unless this is the last line, then send 0)

? bytes ASCII printable text (any length). Last byte must be a 0

17 — Picture Download

S.A. 17 is used by the interface whenever you request downloads "DC", "DO", "DW", or "DP". Three formats are accepted by this channel:

— 1 —

1 byte The letter "W" (Hex $57, decimal 87)

2 bytes Ignored

Repeated for all 25 lines:

640 bytes Graphics data (80 columns)

— 2 —

1 byte The letter "O" or "P" (Hex $4F, $50; dec. 79, 80)
"O" will cause the picture to print immediately
"P" will hold the picture for later mixing with text

2 bytes Ignored

Repeated for all 25 lines:

320 bytes Graphics data (40 columns)

— 3 —

1 byte The letter "C" (Hex $43, decimal 67)

224 bytes Customizer data for zero page addresses $20 thru $FF
(Dangerous locations are protected automatically)

18 — Font Download

This secondary address is used by the download commands "DN" and "DS" to transfer the font imagery to RAM and make the fonts usable by the interface. Two formats are supported:

— 1—

1 byte The letter "N" (Hex $4E, decimal 78)

1 byte A digit representing the font being defined ("5" thru "8")

2 bytes Ignored

For all 96 characters of font:

18 bytes 9 columns of imagery (pass 1, 2, 1, 2, etc.)

1 byte Proportional info (width × 8 + left offset)

1 byte Ignored

— 2 —

1 byte The letter "S" (Hex $53, decimal 83)

1 byte A digit representing the font being defined ("5" thru "8")

2 bytes Ignored

For all 96 characters of font:

18 bytes Left 9 column of imagery (pass 1, 2, 1 2, etc.)

1 byte Proportional info (width × 8 + left offset)

1 byte Ignored

For all 96 characters of font:

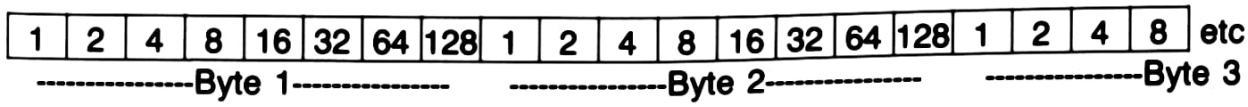
18 bytes Right 9 column of imagery (pass 1, 2, 1, 2, etc.)

2 bytes Ignored

19 — User Channel

This channel is normally used by the banner channel (14) to print its graphics. You can jump in, however, and use this S.A. directly if you know its format.

The horizontal line of 80 columns is divided into 40 graphics blocks. Each bit of the data bytes you send corresponds to one of these blocks, requiring 5 bytes for each line:



Due to the way these graphics are printed, the printer only prints actual output after every 2 such lines of graphics sent. To prevent an odd line from being unprinted, you can send 5 bytes of 0 at the end of a set of data to "purge" any leftovers.

The banner smoothing commands (S0, S1, S2, etc.) have no effect on the graphics printed using S.A. 19.

READING THE DIP SWITCHES

If you have used the program "SWITCHES" on the utility disk, you might have been amazed that the software was sensing how the DIP switches on the interface were set, even as you changed them. The *Gold* has a provision for software to do just that, if you know the secret. You can use this feature in your software to make sure the user has the DIP switches set a certain way. Or you could even use the DIP switches for your own purpose, like selecting options in your program with them. Of course, if you do so, and also try to use the interface for printing, the interface still looks at the switches in the traditional way.

The way the switches are sensed is by reading a data file from the interface called "SWITCHES":

```
10 OPEN 1,4,0, "SWITCHES"
20 GET#1,A$,B$
30 CLOSE 1
40 A=ASC(A$+CHR$(0)):B=ASC(B$+CHR$(0))
```

When this program runs, the variable 'A' holds the image of bank A of the DIP switches, 'B' holds the image for bank B. Each DIP switch has a value thus:

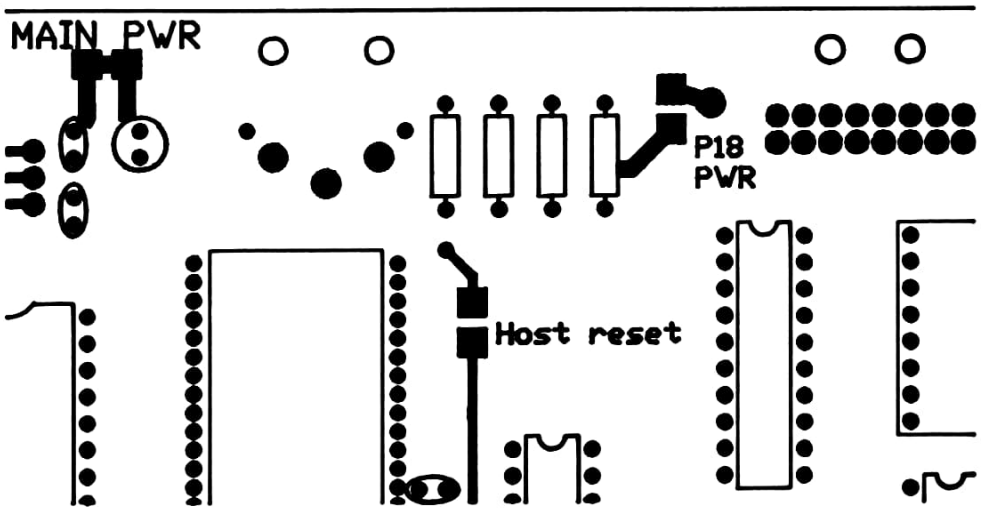
Switch Number	Value
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

Each DIP switch in the "on" position will have its value added to the value for that bank of switches. To find the status of a particular switch, take the value for the desired bank and **AND** it with the value of the switch in question. If the result is 0, the switch is off. Any other result means it's on.

HARDWARE MODIFICATIONS

There are several changes you can make to the Super Graphix *Gold* to suit your individual needs. Be warned that these modifications are for experienced persons only (they require soldering with a fine-tipped iron). These changes also will void the interface's warranty—think about it!

For either of the following modifications, you need to remove the four screws holding the cover in place and lift the cover to reveal the printed circuit board. Find the portion of the board depicted below.



Host reset — This modification makes the interface (and most printers) reset whenever the host (the computer) resets or first turns on. Usually, they are immune from resetting when the host does. To make this mod, bridge solder between the two square pads marked "host reset."

Power from printer — If your printer has +5 volts on pin 18, you can make two modifications that will allow you to eliminate the interface's wall power adaptor. First, you must cut the connection between the squares marked "MAIN PWR." You must then bridge the two squares together marked "P18 PWR."

BURST MODE

This section only applies to users who have the SuperGraphix *Gold* connected to a 128 or 128D computer. These computers have the ability to **burst** load files from disk drives like the 1571. Burst-loading is a communication technique that is much faster than a normal serial operation. For this to be possible, both the sender (1571) and receiver (computer) must have special circuitry to handle the high data rate. On the standard Commodore system,

burst data transfers only happen from disk drive to computer. Designed into the SuperGraphix *Gold* is a burst mode that will accept burst data *from the computer to the interface*. The interface has the necessary hardware to handle this type of transmission. There's a problem though—the 128 and 128D have the hardware necessary to output in burst format, but no software to accomplish this. Consequently, we have included a burst-output routine that you can use or integrate into your software. It sends the data to the interface in a burst format slightly modified for the SuperGraphix *Gold*.

The format consists of a header of two bytes sent in the slow serial (software-clocked) mode:

$2E hex ("Listen" command for device 14)
Secondary address added to $60 hex

The interface and computer at this point both prepare themselves for the burst transmission, which is a block of bytes of a variable length:

Status byte — $00 means the data block that follows is 256 long
$44 means the next byte sent is the data block count
(0 to 255)
$FF means that no data follows (exit burst mode)

Count byte — Gives length of data block that follows (0 to 255)
Omitted if status byte is $00 or $FF

Data bytes

When the data block is completed, another data block is expected. This goes on and on until a status byte of $FF is sent, which completes the transmission. When this happens, both devices revert back to normal serial communication and the serial bus becomes idle.

What on earth is device # 14? The *Gold* has two device numbers. The main one (usually 4) is used for all normal printing. Device 14 is a permanent device number the interface responds to when burst-printing is desired.

Burst Software Driver

A machine language routine to do the burst-printing is included on the utility disk under the name "BURST DRIVER". It only works on the 128 and 128D (the C-64 doesn't have the necessary hardware). The routine loads at address $1300 but can be hand-relocated to fit your needs. Before calling it, you need to prepare the following:

- Set address $FF to the secondary address to use
- Somewhere in zero page ($00 to $FF), a two-byte pointer needs to be prepared that points to the first byte of the data to be printed. Remember that they must be in lo/hi order.

- Accumulator A must be set to the address of the pointer that was prepared in the previous step.
- Registers X and Y must hold the low and high bytes, respectively, of the address of the last byte in the data block +1.

Notice the similarity to the setup for the Kernal SAVE routine ($FFD8). When all is ready, JSR to $1300 (the 1st location of the routine) to print the data. The data block used with this routine can be as large as you want, as it takes care of breaking it into smaller blocks that can be legally transmitted.

HOW THE INTERFACE WORKS

Contained within the small case of your Super Graphix *Gold* interface is a self-contained computer with 32K of RAM and a 32K program in ROM. To oversimplify it, this computer receives data sent from your computer (C-64 or 128) through the serial cable (the long round one). It then takes this data and performs numerous transformations depending on how the DIP switches are set and how you have 'programmed' the interface (what modes you have selected, what commands you have sent to the command channel, etc.). The data is also modified so that it will work with your specific printer (that's why you have to set the 4 switches to match your printer).

This simple overview is nearly correct when all you send to be printed is text in the normal dot matrix mode. Other interface operations aren't quite so simple:

- The picture channel accepts 8000 bytes from the user (a straightforward dump of the hi-res bit map) and completely reconstructs it so that it is arranged properly for your printer.

- The patterns for fonts are stored in the ROM along with the control program. The User fonts, however, are stored in areas of the 8K RAM. This is how fonts are printed:

1) The first time the printer carriage is moved from left to right, 8 of the 16 vertical dots of each letter are printed.
2) The paper is moved up half the width of a dot.
3) The carriage again moves from left to right (pass 2) but this time it prints the other 8 of the 16 vertical dots of each letter.

When both passes have been printed, therefore, each letter is comprised of 16 unique dots vertically and 9 dots horizontally (separated by anywhere from 0 to 7 dots).

A Superfont is printed the same way, except that each character is 18 dots wide. Also, the printer is instructed to print the dots more compactly so that the 18 will occupy the same space as 9 normally did.

Any line that has underlining in it causes the interface to make a third pass, at which time only the underlining is printed.

The different pitches, boldfacing, italicizing, superscripts, and subscripts are all achieved by mathematically manipulating the patterns for the font.

The control program in the interface is of a multi-tasking design with two separate tasks sharing the processor. One concentrates on talking and listening to the computer and storing the data received into the buffer. The other task's objective is to retrieve data from the buffer and transform it depending on the DIP switches and features selected. The data is finally modified for your particular printer and then physically sent to it for printing.

APPENDIX A
Troubleshooting

PROBLEM	POSSIBLE CAUSES
?SYNTAX ERROR ?FILE OPEN ERROR ?FILE NOT OPEN	These errors are the user's fault. Read the section on printing from BASIC.
Computer locks up when you try to print something	Interface not hooked up properly Printer is turned off Printer is not on line
Nothing ever prints (you just get 'READY')	Using wrong device number Printer is off or off line
?DEVICE NOT PRESENT	Using wrong device number, Interface cables not hooked up correctly
Lines printed on top of one another	Using secondary addresses 1,5,8 Switches B1, B2 set incorrectly
Lines double-spaced	Printer's auto line feed is on Switches B1, B2 set incorrectly
Printing garbage	Printer selection switches (B5,B6,B7,B8) set wrong Using wrong mode
Fonts come out as garbage	Printer selection switches set wrong
Fonts print in dot matrix	Using S.A. 4 or 5 Using transparent mode Printer can't print fonts
Interface LED flashing	Error occurred
Fonts come out "grainy"	Enhance mode off (switch A3)

APPENDIX B
Error Messages

Following are the error codes and corresponding messages that the interface can generate. They are detected by reading the error channel (see p. 21).

0 — OK
Everything is fine

1 — SG GOLD REV x.x BY XETEC
Everything is fine. This is just the "sign-on" message received after the interface is reset or turned on

20 — ILLEGAL COMMAND
The command channel received something it couldn't understand

21 — ILLEGAL VALUE
The value following a command was not of an acceptable value

22 — BAD FONT NUMBER
The font number specified in the command is not legal

23 — FILE NOT FOUND
The file specified in a download command could not be found on the disk in the floppy drive

24 — DRIVE NOT PRESENT
25 — DRIVE NOT PRESENT
Both of these errors indicate that something went wrong with the serial communications when the interface was trying to download a file from the disk drive

APPENDIX C
1525 Graphics Commands

In the "1525 emulation" and "SuperGraphix" modes, the 1525's special graphics commands can be used (even if a font is selected).

CHR$(8) - Dot graphics

This command puts the interface into the dot graphics mode. When in this mode, if you send codes from 128 to 255, they will be printed as columns of dots.

For example, to print the greek letter Omega:

```
OPEN 1,4
PRINT#1,CHR$(8)CHR$(222)CHR$(225)CHR$(129);
PRINT#1,CHR$(129)CHR$(225)CHR$(222)
CLOSE 1
```

CHR$(14) - Double width on

This command starts the double-width mode. If the dot graphics mode was on, it will be shut off. The double-width mode stays on until you shut it off with a CHR$(15). If you are trying to send code 14 to your printer, send the double-width-on code for your printer (it will be translated to 14 by the interface).

CHR$(15) - Double width off

This shuts off the double- width and the dot graphics modes. If you are trying to send a code 15 to your printer, send the double-width-off code for your printer (it will be translated to 15 by the interface).

CHR$(16) - Tab

This command is used to specify where to start printing next. For example, to print "HELLO" starting at the 19th column:

```
OPEN 1,4
PRINT#1,CHR$(16)"19HELLO"
CLOSE 1
```

CHR$(27)CHR$(16)CHR$(n1)CHR$(n2) - Dot tab

This command, only usable when the dot graphics mode [CHR$(8)] is on, specifies which dot column to start printing at next (number of dots instead of number of characters). The number of dots is calculated by n1 × 256 + n2. For example, to print an astrisk 300 dots from the left side:

```
OPEN 1,4
PRINT#1, CHR$(8)CHR$(27)CHR$(16)CHR$(1)CHR$(44);"*"
    (because 1 × 256 + 44 =300).
CLOSE 1
```

CHR$(26)CHR$(n)CHR$(g) - Graphics repeat

This command can only be used while in the dot graphics mode. It repeats the dot graphic 'g' (must be at least 128) a total of 'n' times. For example, to print a bar 200 dots long:

```
OPEN 1,4
PRINT#1,CHR$(8)CHR$(26)CHR$(200)CHR$(255)
CLOSE 1
```

CHR$(17) - Cursor down mode

Temporarily switch to upper and lower case.

```
OPEN 1,4,0
PRINT#1, "UPPER CASE";CHR$(17);"LOWER CASE"
CLOSE 1
```

CHR$(145) - Cursor up mode

Temporarily switch to upper case.

```
OPEN 1,4,7
PRINT#1,"LOWER CASE";CHR$(145);"UPPER CASE"
CLOSE 1
```

CHR$(18) - Reverse on

This turns on reverse printing mode (white letters on black background.)

```
OPEN 1,4
PRINT#1, "NORMAL AND ";CHR$(18);"INVERSE"
PRINT#1, "THIS WILL [RVS ON] DO IT, TOO"
CLOSE 1
```

CHR$(146) - Reverse off

Turn off reverse printing mode. If you don't shut it off, it will automatically turn off at the end of the current line.

```
OPEN 1,4
PRINT#1,CHR$(18);"INVERSE ";CHR$(146);"NORMAL"
PRINT#1,CHR$(18);"INVERSE[RVS OFF] NORMAL"
CLOSE 1
```

APPENDIX D
Listing Abbreviations

- Control Codes

ASCII	V Mode	M Mode	Key
2		[ULON]	Underline on
5		[WHT]	White
7		[BELL]	Bell tone
8		[DISH]	Disable Shift
9		[ENSH]	Enable Shift
11		[ENCH]	Enable chr set change (128 mode)
12		[DICH]	Disable chr set change (128 mode)
14		[SWLC]	Switch to lower case
15		[FLON]	Flash on
17		[DOWN]	Cursor down
18		[RVON]	Reverse on
19		[HOME]	Home cursor
20		[DEL]	Delete
24		[TAB]	Tabulate
27		[ESC]	Escape
28		[RED]	Red
29		[RGHT]	Cursor right
30		[GRN]	Green
31		[BLU]	Blue
129		[ORNG]	Orange
130		[ULOF]	Underline off
131		[RUN]	RUN command
133		[F1]	Function 1
134		[F3]	Function 3
135		[F5]	Function 5
136		[F7]	Function 7
137		[F2]	Function 2
138		[F4]	Function 4
139		[F6]	Function 6
140		[F8]	Function 8
141		[SHRT]	Shifted return
142		[SWUC]	Switch to upper case
143		[FLOF]	Flash off
144		[BLK]	Black
145		[UP]	Cursor up
146		[RVOF]	Reverse off
147		[CLR]	Clear screen
148		[INST]	Insert
149		[BRWN]	Brown
150		[LRED]	Light red
151		[GRY1]	Grey 1
152		[GRY2]	Grey 2
153		[LGRN]	Light green
154		[LBLU]	Light blue
155		[GRY3]	Grey 3
156		[PUR]	Purple
157		[LEFT]	Cursor left
158		[YEL]	Yellow
159		[CYAN]	Cyan

• Graphics Characters

G Mode	K Mode	A Mode
	[S*]	[192]
	[SA]	[193]
	[SB]	[194]
	[SC]	[195]
	[SD]	[196]
	[SE]	[197]
	[SF]	[198]
	[SG]	[199]
	[SH]	[200]
	[SI]	[201]
	[SJ]	[202]
	[SK]	[203]
	[SL]	[204]
	[SN]	[205]
	[SM]	[206]
	[SO]	[207]
	[SP]	[208]
	[SQ]	[209]
	[SR]	[210]
	[SS]	[211]
	[ST]	[212]
	[SU]	[213]
	[SV]	[214]
	[SW]	[215]
	[SX]	[216]
	[SY]	[217]
	[SZ]	[218]
	[S+]	[219]
	[C-]	[220]
	[S-]	[221]
	[PI]	[222]
	[C*]	[223]

G Mode	K Mode	A Mode
	[S]	[160]
	[CK]	[161]
	[CI]	[162]
	[CT]	[163]
	[C@]	[164]
	[CG]	[165]
	[C+]	[166]
	[CM]	[167]
	[C#]	[168]
	[S#]	[169]
	[CN]	[170]
	[CQ]	[171]
	[CD]	[172]
	[CZ]	[173]
	[CS]	[174]
	[CP]	[175]
	[CA]	[176]
	[CE]	[177]
	[CR]	[178]
	[CW]	[179]
	[CH]	[180]
	[CJ]	[181]
	[CL]	[182]
	[CY]	[183]
	[CU]	[184]
	[CO]	[185]
	[S@]	[186]
	[CF]	[187]
	[CC]	[188]
	[CX]	[189]
	[CV]	[190]
	[CB]	[191]

APPENDIX E
Standard ASCII vs. PET ASCII

Dec.	Hex	Standard	PET	Dec.	Hex	Standard	PET
32	20	space	space	47	2F	/	/
33	21	!	!	48	30	0	0
34	22	"	"	49	31	1	1
35	23	#	#	50	32	2	2
36	24	$	$	51	33	3	3
37	25	%	%	52	34	4	4
38	26	&	&	53	35	5	5
39	27	'	'	54	36	6	6
40	28	(	(	55	37	7	7
41	29	)	)	56	38	8	8
42	2A	*	*	57	39	9	9
43	2B	+	+	58	3A	:	:
44	2C	,	,	59	3B	;	;
45	2D	-	-	60	3C	<	<
46	2E	.	.	61	3D	=	=

Dec.	Hex	Standard	PET	Dec.	Hex	Standard	PET
62	3E	>	>	92	5C	\	£
63	3F	?	?	93	5D	]	]
64	40	@	@	94	5E	^	↑
65	41	A	a	97	61	a	A
66	42	B	b	98	62	b	B
67	43	C	c	99	63	c	C
68	44	D	d	100	64	d	D
69	45	E	e	101	65	e	E
70	46	F	f	102	66	f	F
71	47	G	g	103	67	g	G
72	48	H	h	104	68	h	H
73	49	I	i	105	69	i	I
74	4A	J	j	106	6A	j	J
75	4B	K	k	107	6B	k	K
76	4C	L	l	108	6C	l	L
77	4D	M	m	109	6D	m	M
78	4E	N	n	110	6E	n	N
79	4F	O	o	111	6F	o	O
80	50	P	p	112	70	p	P
81	51	Q	q	113	71	q	Q
82	52	R	r	114	72	r	R
83	53	S	s	115	73	s	S
84	54	T	t	116	74	t	T
85	55	U	u	117	75	u	U
86	56	V	v	118	76	v	V
87	57	W	w	119	77	w	W
88	58	X	x	120	78	x	X
89	59	Y	y	121	79	y	Y
90	5A	Z	z	122	7A	z	Z
91	5B	[	[				

APPENDIX F
International Character Sets

Following are the different font character options selectable with the command channel **X** command (see p. 38). The "Commodore" set is used any time the "U.S.A." set is selected and Commodore ASCII conversion is on.

Set	Country	35	36	64	91	92	93	94	95	96	123	124	125	126
0	Commodore	#	$	@	[	£	]	↑	←	—	+	▒	▌	π
0	USA	#	$	@	[	\	]	^	_	`	{	¦	}	~
1	France	#	$	à	°	ç	§	^	_	`	é	ù	è	~
2	Germany	#	$	§	Ä	Ö	Ü	^	_	`	ä	ö	ü	ß
3	England	£	$	@	[	\	]	^	_	`	{	¦	}	~
4	Denmark	#	$	@	Æ	Ø	Å	^	_	`	æ	ø	å	~
5	Sweden	#	¤	É	Ä	Ö	Å	Ü	_	é	ä	ö	å	ü
6	Italy	#	$	@	°	\	é	^	_	ù	à	ò	è	ì
7	Spain	#	$	@	¡	Ñ	¿	^	_	`	{	ñ	}	~
8	Norway	#	¤	É	Æ	Ø	Å	Ü	_	é	æ	ø	å	ü
9	Denmark II	#	$	É	Æ	Ø	Å	Ü	_	é	æ	ø	å	ü

APPENDIX G
Escape Tables

Key to entering the letters in the "sequence" column: *italicized* letters should be entered by holding SHIFT with the letter. CAPITAL letters are entered without SHIFT held. This may seem confusing, but that's the tradition with Commodore interfaces. Lowercase escape codes (ESC p 0) are the hardest to enter — you can't enter the "p" inside quotes, but must send its value shown in the "codes" column. So, for "p" you would have to send CHR$(112)! Of course, ESC always represents CHR$(27).

Codes with an asterisk (*) are likely to be unaccessible in the 1525, Gold, and SuperGraphix modes.

SuperGraphix Escape Codes

Sequence	Codes	Effect
ESC 1	27 1	Select font 1 (NLQ)
ESC 2	27 2	Select font 2 (User 1)
ESC 3	27 3	Select font 3 (User 2)
ESC 4	27 4	Select dot matrix
ESC 14	27 14	Turn on expand mode
ESC 15	27 15	Turn on compress mode
ESC 20	27 20	Turn off compress mode
ESC '–' 1	27 45 1	Turn on underlining
ESC '–' 0	27 45 0	Turn off underlining
ESC '0'	27 48	Set to 8 lines per inch
ESC '2'	27 50	Set to 6 lines per inch
ESC '3' n	27 51 n	Set line spacing to 'n' increments
ESC 'A' n	37 65 n	Set line spacing to n/72"
ESC 'B' 1	27 66 1	Select pica pitch
ESC 'B' 2	27 66 2	Select elite pitch
ESC 'B' 3	27 66 3	Turn on compress mode
ESC 'B' 4	27 66 4	Elite pitch = 13 CPI
ESC 'B' 5	27 66 5	Elite pitch = 12 CPI
ESC 'E'	27 69	Turn on emphasized mode
ESC 'F'	27 70	Shut off emphasized mode
ESC 'G'	27 71	Turn on boldface
ESC 'H'	27 72	Shut off boldface
ESC 'S' 0	27 83 0	Turn on superscripts
ESC 'S' 1	27 83 1	Turn on subscripts
ESC 'T'	27 84	Shut off sub- or superscripts
ESC 'W' 1	27 87 1	Turn on expand mode
ESC 'W' 0	27 87 0	Shut off expand mode
14	14	Turn on expand mode
15*	15*	Turn on compress mode
18*	18*	Shut off compress, pitch = pica
20*	20*	Shut off compress and expand

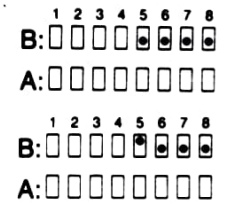
Standard Escape Codes

These codes are common to all printer selections.

Sequence	Codes	Effect
ESC *'I'* 1	27 201 1	Turn italicizing on
ESC *'I'* 0	27 201 0	Turn italicizing off
ESC *'P'* 1	27 208 1	Turn proportional on
ESC *'P'* 0	27 208 0	Turn proportional off
ESC *'S'* 0	27 211 0	Set pica pitch (10 cpi)
ESC *'S'* 1	27 211 1	Set alternate pitch (11 cpi)
ESC *'S'* 2	27 211 2	Set Elite pitch (12 cpi)
ESC *'S'* 3	27 211 3	Set connect pitch
ESC 1	27 1	Select NLQ font
ESC 2	27 2	Select Helvetica font
ESC 3	27 3	Select Broadway font
ESC 4	27 4	Select Script font
ESC 5	27 5	Select user font 1
ESC 6	27 6	Select user font 2
ESC 7	27 7	Select user font 3
ESC 8	27 8	Select user font 4
ESC 9	27 9	Select dot matrix

Epson MX-80

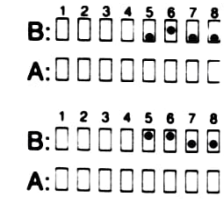
Epson



Sequence	Codes	Effect
14*	14*	Expand on
15*	15*	Compress on
18*	18*	Compress off, pica pitch
20*	20*	Expand off
ESC 'E'	27 69	Boldface on
ESC 'F'	27 70	Boldface off
ESC '–' 1	27 45 1	Underlining on
ESC '–' 0	27 45 0	Underlining off
ESC 'S' 1	27 83 1	Subscripts on
ESC 'S' 0	27 83 0	Superscripts on
ESC 'T'	27 84	Subscripts/superscripts off
ESC '0'	27 48	Set line spacing to 8 lines/inch
ESC '2'	27 50	Set line spacing to 6 lines/inch
ESC '3' n	27 51 n	Set line spacing to n increments
ESC 'A' n	27 65 n	Set line spacing to n/72"
ESC 'P'	27 80	Select pica pitch (10 c.p.i.)
ESC 'M'	27 77	Select elite pitch (12 c.p.i.)

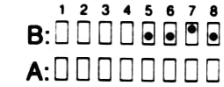
Gemini 10

Gemini 10X



Sequence	Codes	Effect
14*	14*	Expand on
15*	15*	Compress on
18*	18*	Compress off, pica pitch
20*	20*	Expand off
ESC 'E'	27 69	Boldface on
ESC 'F'	27 70	Boldface off
ESC '–' 1	27 45 1	Underlining on
ESC '–' 0	27 45 0	Underlining off
ESC 'S' 1	27 83 1	Subscripts on
ESC 'S' 0	27 83 0	Superscripts on
ESC 'T'	27 84	Subscripts/superscripts off
ESC '0'	27 48	Set line spacing to 8 lines/inch
ESC '2'	27 50	Set line spacing to 6 lines/inch
ESC '3' n	27 51 n	Set line spacing to n increments
ESC 'A' n	27 65 n	Set line spacing to n/72''
ESC 'B' 1	27 66 1	Select pica pitch
ESC 'B' 2	27 66 2	Select elite pitch
ESC 'B' 3	27 66 3	Turn on compress mode
ESC 'B' 4	27 66 4	Fonts enabled
ESC 'B' 5	27 66 5	Fonts disabled
ESC 'G'	27 71	Boldface on
ESC 'H'	27 72	Boldface off

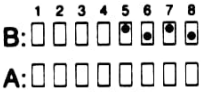
IBM



Sequence	Codes	Effect
14*	14*	Expand on
15*	15*	Compress on
18*	18*	Compress off, pica pitch
20*	20*	Expand off
ESC 'E'	27 69	Boldface on
ESC 'F'	27 70	Boldface off
ESC 'G'	27 71	Boldface on
ESC 'H'	27 72	Boldface off
ESC 'I' 1	27 73 1	Italics on
ESC 'I' 0	27 73 0	Italics off
ESC '–' 1	27 45 1	Underlining on
ESC '–' 0	27 45 0	Underlining off
ESC 'M'	27 77	Select elite pitch
ESC 'P'	27 80	Select pica pitch
ESC 'S' 1	27 83 1	Subscripts on

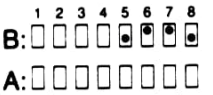
ESC 'S' 0	27 83 0	Superscripts on
ESC 'T'	27 84	Subscripts/superscripts off
ESC 'W' 1	27 87 1	Expand on
ESC 'W' 0	27 87 0	Expand off
ESC '0'	27 48	Set line spacing to 8 lines/inch
ESC '2'	27 50	Set line spacing to 6 lines/inch
ESC '3' n	27 51 n	Set line spacing to n increments
ESC 'A' n	27 65 n	Set line spacing to n/72''
ESC '4'	27 52	Fonts enabled
ESC '5'	27 53	Fonts disabled
ESC 'p' 1	27 112 1	Proportional on
ESC 'p' 0	27 112 0	Proportional off

Okidata



Sequence	Codes	Effect
29*	29*	Compress/expand off, elite pitch
28*	28*	Compress off
30*	30*	Compress/expand off, pica pitch
31*	31*	Expand on
ESC '1'	27 49	Fonts enabled
ESC '0'	27 48	Fonts disabled
ESC '6'	27 54	Set line spacing to 6 lines/inch
ESC '8'	27 56	Set line spacing to 8 lines/inch
ESC 'C'	27 67	Underlining on
ESC 'D'	27 68	Underlining off
ESC 'T'	27 84	Boldface on
ESC 'H'	27 72	Boldface on
ESC 'I'	27 73	Boldface off
ESC 'J'	27 74	Superscripts on
ESC 'K'	27 75	Superscripts off
ESC 'L'	27 76	Subscripts on
ESC 'M'	27 77	Subscripts off

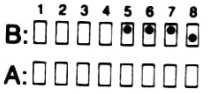
Okidata 192



Sequence	Codes	Effect
28*	28*	Compress/expand off, elite pitch
29*	29*	Compress on
30*	30*	Compress/expand off, pica pitch
31*	31*	Expand on
ESC '!/'	27 33 47	Italics on
ESC '!*'	27 33 42	Italics off
ESC '1'	27 49	Fonts enabled
ESC '0'	27 48	Fonts disabled

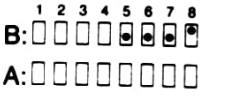
ESC '6'	27 54	Set line spacing to 6 lines/inch
ESC '8'	27 56	Set line spacing to 8 lines/inch
ESC 'C'	27 67	Underlining on
ESC 'D'	27 68	Underlining off
ESC 'T'	27 84	Boldface on
ESC 'H'	27 72	Boldface on
ESC 'I'	27 73	Boldface off
ESC 'J'	27 74	Superscripts on
ESC 'K'	27 75	Superscripts off
ESC 'L'	27 76	Subscripts on
ESC 'M'	27 77	Subscripts off

Prowriter



Sequence	Codes	Effect
14*	14*	Expand on
15*	15*	Expand off
ESC '!'	27 33	Boldface on
ESC ''	27 34	Boldface off
ESC 'A'	27 65	Set line spacing to 6 lines/inch
ESC 'B'	27 66	Set line spacing to 8 lines/inch
ESC 'E'	27 69	Compress off, elite pitch
ESC 'N'	27 78	Compress off, pica pitch
ESC 'P'	27 80	Proportional on
ESC 'Q'	27 81	Compress on
ESC 'X'	27 88	Underlining on
ESC 'Y'	27 89	Underlining off

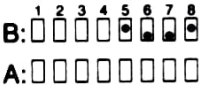
8510 s/sc



Sequence	Codes	Effect
14*	14*	Expand on
15*	15*	Expand off
ESC '!'	27 33	Boldface on
ESC ''	27 34	Boldface off
ESC 'A'	27 65	Set line spacing to 6 lines/inch
ESC 'B'	27 66	Set line spacing to 8 lines/inch
ESC 'E'	27 69	Compress off, elite pitch
ESC 'N'	27 78	Compress off, pica pitch
ESC 'P'	27 80	Proportional on
ESC 'Q'	27 81	Compress on
ESC 'X'	27 88	Underlining on
ESC 'Y'	27 89	Underlining off
ESC 'i' 1	27 105 1	Italics on
ESC 'i' 0	27 105 0	Italics off

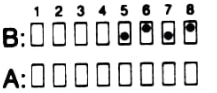
ESC 'n'	27 110	Expand on
ESC 's' 0	27 115 0	Superscripts/subscripts off
ESC 's' 1	27 115 1	Superscripts on
ESC 's' 2	27 115 2	Subscripts on

GX-100



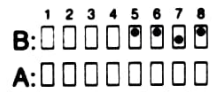
— None —

Blue Chip



Sequence	Codes	Effect
14*	14*	Expand on
15*	15*	Compress on
18*	18*	Compress off, pica pitch
20*	20*	Expand off
ESC 'E'	27 69	Boldface on
ESC 'F'	27 70	Boldface off
ESC 'G'	27 71	Boldface on
ESC 'H'	27 72	Boldface off
ESC '–' 1	27 45 1	Underlining on
ESC '–' 0	27 45 0	Underlining off
ESC 'S' 1	27 83 1	Subscripts on
ESC 'S' 0	27 83 0	Superscripts on
ESC 'T'	27 84	Subscripts/superscripts off
ESC 'W' 1	27 87 1	Expand on
ESC 'W' 0	27 87 0	Expand off
ESC '0'	27 48	Set line spacing to 8 lines/inch
ESC '2'	27 50	Set line spacing to 6 lines/inch
ESC '3' n	27 51 n	Set line spacing to n increments
ESC 'A' n	27 65 n	Set line spacing to n/72"
ESC '4'	27 52	Italics on
ESC '5'	27 53	Italics off

Star NB-24

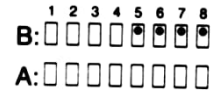


Epson LQ

Sequence	Codes	Effect
14*	14*	Expand on
15*	15*	Compress on
18*	18*	Compress off, pica pitch
20*	20*	Expand off
ESC 'E'	27 69	Boldface on

ESC 'F'	27 70	Boldface off
ESC 'G'	27 71	Boldface on
ESC 'H'	27 72	Boldface off
ESC 'I' 2	27 73 2	Fonts enabled
ESC 'I' 0	27 73 0	Fonts disabled
ESC '–' 1	27 45 1	Underlining on
ESC '–' 0	27 45 0	Underlining off
ESC 'M'	27 77	Select elite pitch
ESC 'P'	27 80	Select pica pitch
ESC 'S' 1	27 83 1	Subscripts on
ESC 'S' 0	27 83 0	Superscripts on
ESC 'T'	27 84	Subscripts/superscripts off
ESC 'W' 1	27 87 1	Expand on
ESC 'W' 0	27 87 0	Expand off
ESC '0'	27 48	Set line spacing to 8 lines/inch
ESC '2'	27 50	Set line spacing to 6 lines/inch
ESC '3' n	27 51 n	Set line spacing to n increments
ESC 'A' n	27 65 n	Set line spacing to n/72"
ESC '4'	27 52	Italics on
ESC '5'	27 53	Italics off
ESC 'k' n	27 107 n	Select font n
ESC 'p' 1	27 112 1	Proportional on
ESC 'p' 0	27 112 0	Proportional off
ESC 'x' 1	27 120 1	Fonts enabled
ESC 'x' 0	27 120 0	Fonts disabled

Daisy Wheel



— None —

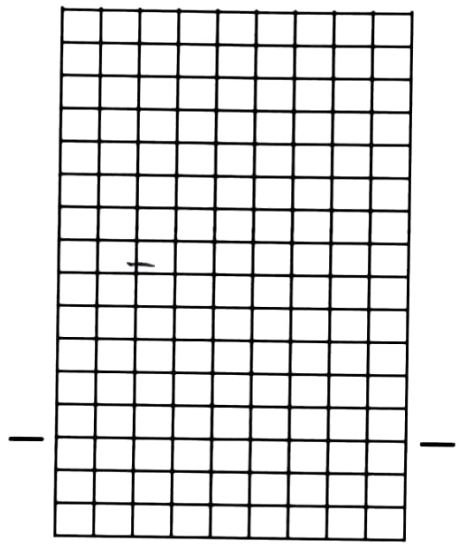
APPENDIX H
Printer Info

The following table shows what information is stored internally for each of the printer type settings. If your printer isn't listed in the chart on page 7, you might want to get out your printer manual and look for which of the settings below most closely matches your printer's functions. Then use that setting for switches B5, B6, B7, and B8. If none of the settings is even close, use the last one (for daisy-wheel printers).

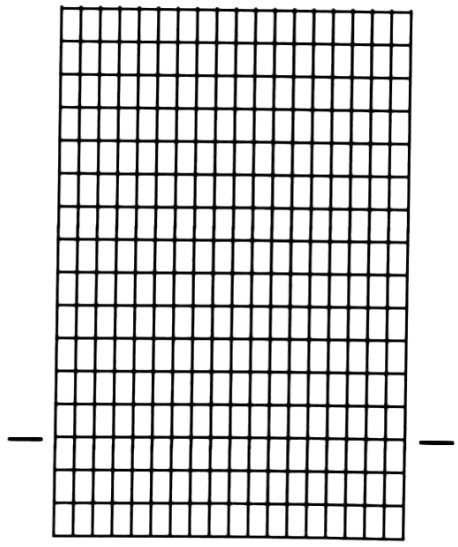
Function	B: 5678	5678	5678	5678	5678	5678	5678	5678	5678	5678	5678	5678	5678
Wide carriage width	132	132	132	132	132	136	136	132	132	132	132	132	132
Double width start	14	14	14	14	14	31	31	14	14	14	14	14	—
Double width stop	20	20	20	20	20	30	30	15	15	15	20	20	—
Carriage return shuts off double-width?	Y	Y	Y	Y	Y	N	N	N	N	N	Y	Y	—
Set to 6 lines/inch	27	27	27	27	27	27	27	27	27	—	27	27	—
	50	50	50	50	50	54	54	65	65	—	50	50	—
Set to 8 lines/inch	27	27	27	27	27	27	27	27	27	—	27	27	—
	48	48	48	48	48	56	56	66	66	—	48	48	—
Set line feed size	27	27	27	27	27	27	27	27	27	—	27	27	—
	51	51	51	51	51	37	37	84	84	—	51	51	—
	—	—	—	—	—	57	57	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
Do line feed size	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
Set line feed to graphics size	27	27	27	27	27	27	27	27	27	8	27	27	—
	51	51	51	51	51	37	37	84	84	—	65	51	—
	21	21	14	14	14	57	57	49	49	—	6	18	—
	—	—	—	—	—	14	14	53	53	—	—	—	—
7 wire GRX LF size	21	21	14	14	14	14	14	15	15	7	18	21	—
8 wire GRX LF size	24	24	16	16	16	16	16	16	16	8	18	24	—
LF numbering	n	n	n	n	n	n	n	xx	xx	n	n	n	—
Dot graphics: bit 1 at bottom or top?	Bot	Bot	Bot	Bot	Bot	Top	Top	Top	Top	Top	Bot	Bot	—
Single res. GRX	27	27	27	27	27	3	27	27	27	8	27	27	—
	75	75	75	75	75	—	80	83	83	—	75	42	—
	—	—	—	—	—	—	30	—	—	—	—	32	—
	—	—	—	—	—	—	3	—	—	—	—	—	—
Dual res. GRX	27	27	27	27	27	—	27	—	—	—	27	27	—
	76	76	76	76	76	—	82	—	—	—	76	42	—
	—	—	—	—	—	—	30	—	—	—	—	33	—
	—	—	—	—	—	—	3	—	—	—	—	—	—
Quad res. GRX	—	27	27	27	27	—	—	—	—	—	27	—	—
	—	90	122	122	90	—	—	—	—	—	90	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
Proportional GRX	—	27	—	—	27	—	—	—	—	—	—	—	—
	—	42	—	—	42	—	—	—	—	—	—	—	—
	—	5	—	—	5	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
GRX numbering	lo/hi	lo/hi	lo/hi	lo/hi	lo/hi	—	—	xxxx	xxxx	—	lo/hi	lo/hi	—
End graphics mode	—	—	—	—	—	3	3	—	—	15	—	—	—
	—	—	—	—	—	2	2	—	—	—	—	—	—
Graphics:													
Horizontal dots/inch	60	60	60	60	60	60	60	60	60	60	80	60	60
Proportional dots/inch	—	70	—	—	—	—	—	—	—	—	—	—	—
Vertical dots/inch	216	216	144	144	216	144	144	144	144	72	216	180	—
Capable of graphics?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Capable of fonts?	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N
Use GRX correction?	N	N	N	N	N	N	N	Y	Y	N	Y	N	—
At least 8 wire head?	N	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N
24 wire head?	N	N	N	N	N	N	N	N	N	N	N	Y	N
Set bit 7 of GRX?	N	N	N	N	N	N	N	N	N	Y	N	N	—
Duplicate all GRX 3's	N	N	N	N	N	Y	Y	N	N	N	N	N	—

APPENDIX I
Font Grids

If you don't feel comfortable creating font characters with a cursor, you can draw your characters on photocopies of the grids below. The lines separating the bottom three rows indicate a good place to put the bottom of each character (then you can use the bottom rows for descenders).



Normal font grid (9 x 16)



Superfont grid (18 x 16)

APPENDIX J
Applications

Speedscript:

For version 1.0 or 2.0:

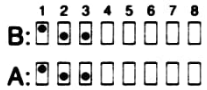
For version 3.0:

Easy Script:

Setup #1 - Set switches:

Select "MX-80" printer from list
Select "s" for serial

Setup #2 - Set switches:



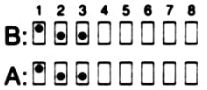
Select "CBM" printer from list

PaperClip:

Setup #1 - Set switches:

Select printer file best suited for your printer.

Setup #2 - Set switches:



Select "1525-P-ALF" printer file

Print Shop:

Setup #1 - Set switches:

Use Commodore side of disk

Setup #2 - Set switches:

Use non-Commodore side of disk
Go to "Setup" and pick your printer

Fontmaster II/128:

Set switches:

APPENDIX K
Buffer Memory

Throughout this manual, references are made to the buffer. Just what is the buffer? Actually, in the Super Graphix *Gold* the buffer is the collective name for 3 areas of RAM in the interface that help it print faster and do other amazing things. You need not worry about them (they will take care of themselves), but it is nice to know what they are doing.

The **graphics buffer** is always 512 bytes long and is entirely dedicated to holding graphics for speedy printing. The **font buffer** is 768 bytes long. It's purpose is to hold the current line of text for font processing. The **main buffer** holds all data waiting to be processed. The main buffer starts at 30,976 bytes, but will decrease as a picture or fonts are loaded to the interface. A smaller buffer size may slow things down a bit but everything will still work the same.

Picture loaded?	Fonts loaded	Main buffer	Total buffer size
No	0	30,976	32,256
No	1	27,136	28,416
No	2	23,296	24,576
No	3	19,456	20,736
No	4	15,616	16,896
Yes	0	22,976	24,256
Yes	1	19,136	20,416
Yes	2	15,296	16,576
Yes	3	11,456	12,736
Yes	4	7,616	8,896

APPENDIX L
Printer Connector Pinout

PIN#	FUNCTION
1	Data strobe
2	Data bit 0
3	Data bit 1
4	Data bit 2
5	Data bit 3
6	Data bit 4
7	Data bit 5
8	Data bit 6
9	Data bit 7
11	Busy
16	Ground
18	Optional 5V power
31	Printer Rest

APPENDIX M
SPECIFICATIONS

Model	Super Graphix *Gold*
Printing modes	Text, Commodore graphics, Fonts (8)
Character sets	96 Text 68 Graphics 96 NLQ font 96 Helvetica font 96 Broadway font 96 Script font 120 International characters
Switches	16, active
Input formats: Serial	Commodore IEC Fast IEC *Gold* burst
Output formats: Serial	Slow IEC Fast IEC Commodore burst
Output format: Parallel	8-bit Centronics
Handshaking	STROBE and BUSY
RAM	32,768 bytes
ROM	32,768 bytes
Firmware	6303 machine language
Power-up self test	RAM check and ROM checksum
Power requirements	
Voltage	5V regulated
Current	80 to 90 ma
Dimensions	6.125''(l)x3.73''(w)x.81''(h)
Serial cable length	4' 7''
Parallel cable length	21''
Weight	1.35 lbs
Disposition	Mean

APPENDIX N
GLOSSARY

1525: Commodore's printer
Active switches: Switches that are constantly checked for changes.
ASCII: American Standard Code for Information Interchange.
Auto line feed: A line feed inserted after carriage returns to achieve proper vertical spacing.
Buffer: In the Super Graphix *Gold*, 3 areas of RAM set aside for housekeeping and speed.
Cold start: Completely re-initializing all functions of the interface
Command channel: A special channel (exclusively on Xetec interfaces) that allows you to control the interface with a multitude of commands.
Device number: The unique number given to your interface to which it (and only it) responds.
Download: A direct transfer of data from disk to the interface.
Emulation: Acting exactly like another device.
Escape code: A sequence of codes starting with an escape (27) which can be sent within text. Escape codes are not printable, but instruct the printer or interface to change its operation in some way.
Font: A character set whose letters are printed in dot matrix but at a high enough density to look typed or even typeset.
Keystrokes: A listing mode on Xetec interfaces in which the key presses that produce a graphics character are listed instead of the character itself.
Mnemonics: Abbreviations for graphics and control characters which are easily remembered and recognized.
PET ASCII: Commodores coding in which upper and lower case letters are reversed as compared to standard ASCII.
Superfont: Fonts with twice the normal horizontal resolution, resulting in a better looking print.

APPENDIX O
SUPER GRAPHIX OPERATING MODES

SWITCHES		SECONDARY ADDRESSES										
FONTS?	MODE (A1-A3)	0	1	2	3	4	5	6	7	8	9	10
Off	1525	DUG	[DUG]	QUG	H	DT	[DT]	QT	DLG	[DLG]	QLG	10
On	1525	QUG	QUG	QUG	H	DT	[DT]	QT	QLG	QLG	QLG	10
Off	Gold	DUG	[DUG]	QUG	H	DT	[DT]	QT	DLG	[DLG]	QLG	10
On	Gold	QUG	QUG	QUG	H	DT	[DT]	QT	QLG	QLG	QLG	10
Off	SuperGraphix	DUG	[DUG]	QUG	H	DT	[DT]	QT	DLG	[DLG]	QLG	10
On	SuperGraphix	QUG	QUG	QUG	H	DT	[DT]	QT	QLG	QLG	QLG	10
Off	ASCII Conv.	DU	[DU]	QU	H	DT	[DT]	QT	DL	[DL]	QL	10
On	ASCII Conv.	QU	QU	QU	H	DT	[DT]	QT	QL	QL	QL	10
—	Hex Monitor	H	H	H	H	H	H	H	H	H	H	H
—	Dec Monitor	10	10	10	10	10	10	10	10	10	10	10
Off	Semi-trans.	DT	[DT]	QT	H	DT	[DT]	QT	DT	[DT]	QT	10
On	Semi-trans.	QT	QT	QT	H	DT	[DT]	QT	QT	QT	QT	10
Off	Transparent	DT	[DT]	DT	DT	DT	[DT]	DT	DT	[DT]	DT	DT
On	Transparent	DT	[DT]	DT	DT	DT	[DT]	DT	DT	[DT]	DT	DT

Key:
- D Dot matrix
- Q Near letter quality
- U Upper case
- L Upper and lower case
- T Transparent
- G Commodore Graphics
- H Hex dump
- 10 Decimal dump
- □ No auto line feeds

APPENDIX P
Secondary Addresses

0	Upper case/graphics
1	Upper case / graphics (no line feed)
2	Upper case / graphics with fonts
3	Hexadecimal dump
4	Transparent
5	Transparent (no line feed)
6	Transparent with fonts
7	Upper/lower case
8	Upper/lower case (no line feed)
9	Upper/lower case with fonts
10	Decimal dump
11	SG Font downloading
12	Hi-res screen dump
13	Lo-res screen dump
14	Banners (or Upper/lower Lo-res screen dump)
15	Command channel
16	Directory channel
17	Picture channel
18	Font download
19	User channel
20 +	Lock the interface

APPENDIX Q
Command Channel Commands

U	Unlock the interface. This will undo an "LK" lock or one that was forced by a secondary address of 20 or more.
I	Print the interface's identification.
E	Empty the buffer
M	BASIC listings—control codes: mnemonic mode
V	BASIC listings—control codes: video mode
G	BASIC listings—graphics codes: graphic mode
A	BASIC listings—graphics codes: ASCII mode
K	BASIC listings—graphics codes: keystroke mode
LK*n*	Lock interface's secondary address to *n*
LF*n*	Set auto line feed mode to *n* (0 thru 3)
#*n*	Set interface device number to *n*
F#*n*	Select device # of disk drive used for downloads (8, 9, etc.)
W*n*	Set the print width to *n* columns
X*n*	Select the international character set (0 — 9). See Appendix F
ST	Print status report (just like holding down the CLEAR button)
QR	Print a quick reference showing the valid secondary addresses

C0	Width compensation off
C1	Width compensation on
Q0	Disables listing mode (cannot list BASIC programs)
Q1	Enable listing mode again
R	Release all RAM for use as buffer (and empty the buffer)
128	Using C-128 computer (with slow serial cable)
SA*n*	Set the auxilliary sec. addr. to *n* (for banner and directory)
D$	Download directory from disk and print it using the aux. S.A.
D$:xxx	Download directory from disk using pattern matching and print
DT:xxxx	Download text file from disk and print (use S.A. 4)
DA:xxxx	Download text file from disk and print (use secondary address set by the SA*n* command)
DC	Download customizer file from disk (created by "FEATURES" program)
DCxxx	Same as "DC" except specifies a specific customizer file
DP:xxxx	Download picture from disk and hold until later
Pzzzz	Select picture options/start mixing picture with text
SP	Stop picture mixing
DO:xxxx	Download 40-column picture from disk and print immediately
DW:xxxx	Download 80-column picture from disk and print immediately
YP	Recover RAM used by picture (add it to buffer)
F*n*	Select font to use for printing (1 — 8)
FS	Select font as set on DIP switches A5 thru A7
N1	Fonts enabled (on)
N0	Fonts disabled (off)
DN*n*:xxxx	Download a normal font from disk to font number *n*
DS*n*:xxxx	Download a super font from disk to font number *n*
?xy	Master selection of font effects (see p. 36)
OT*n*	Set line-to-line spacing to *n* increments while using fonts
OL*n*	Set underlining offset to *n* increments while using fonts
6	Set spacing to 6 lines/inch while using fonts
8	Set spacing to 8 lines/inch while using fonts
SU	With fonts: underline spaces as well as text
SB	With fonts: leave spaces blank between underlines words
BT	Align normal characters with bottom of talls
TP	Align normal characters with top of talls
H1	24 wire printers: shorten characters by 30%
H0	24 wire printers: character shortening off
YF	Recover RAM used by downloaded fonts (add it to buffer)
B0	No banner smoothing
B1	Some banner smoothing
B2	Full banner smoothing
BG	Leave gaps between chunks in banner
BC	Connect all chunks in banner
BW	Double-width banner
BN	Normal-width banner

APPENDIX R
List of Fonts

Fonts in ROM:

NLQ

```
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~¢
```

Helvetica

```
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~¢
```

Broadway

```
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~¢
```

Script

```
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrstuvwxyz{|}~¢
```

Fonts on disk:

	arabic	ﺵﻱﻉﻍﻅﺏﻝﻑﺡﺕﺙﺭﻙﻩﺝﺥﺹﻩﺱﻫﻭﺓﻯﺯ
	bauhaus	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	block	ABCDEFGHIJKLMNOPQRSTUVWXYZ
(S)	borders	┌┐└┘├┤┬┴┼═║╒╓╔╕╖╗╘╙╚╛╜╝╞╟╠╡╢╣╤╥╦╧╨╩╪╫╬
	bubble	ABCDEFGHIJKLMNOPQRSTUVWXYZ
(S)	burgondy	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	busorama	ABCDEFGHIJKLMNOPQRSTUVWXYZ
(S)	celtic	ABCDEFGhIjklmnopqrstuvwxyz
(S)	freehand	*ABCDEFGHIJKLMNOPQRSTUVWXYZ*
	futura	ABCDEFGHIJKLMNOPQRSTUVWXYZ
(S)	goodtype	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	greek	ΑΒΞΔΕΦΓΗΙΘΚΛΜΝΟΠΨΡΣΤΥΩςΧ~Ζ
	hebrew	׳ ־ ׃ ׆ ׳׳ ׇ ׈ ׉ ׊ ׋ ׌ ׍ ׎ ׏ א ב ג ד ה ו ז ח ט י ך כ ל ם מ ן נ ס ע ף פ ץ צ ק ר ש ת ׫ ׬ ׭ ׮ ׯ
(S)	italic	*ABCDEFGHIJKLMNOPQRSTUVWXYZ*
(S)	korean	ㅏㅂㅈㄷㄴㄲㅈㅎㅡㅈㄱㄹㅁㄴㅇㅍㅋㅜㄷㅅㅌㄴㅠㅁㅆㅓㅓ
	manhattan	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	math	AB∣△‖∱√∫∣⌋⌈⌊μ½Ω∏¼∜∠θ⌉⌋%XY∞
	misc	äçƒäμ·›†§Ε©¼x̄½‖¥ÄÖÜ¢Ñäöüßé
	news	ABCDEFGHIJKLMNOPQRSTUVWXYZ
(S)	old english	𝔄𝔅ℭ𝔇𝔈𝔉𝔊ℌℑ𝔍𝔎𝔏𝔐𝔑𝔒𝔓𝔔ℜ𝔖𝔗𝔘𝔙𝔚𝔛𝔜ℨ
(S)	pierrot	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	print	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	russian	АБЦДЕФГХИЖКЛМНОПЯРСТУВЮЭЙЗ
	shadow	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	stop	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	tech	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	visa	ABCDEFGHIJKLMNOPQRSTUVWXYZ

Those marked (S) are superfonts; they require a **DS** command to download. All others require a **DN** command to download.

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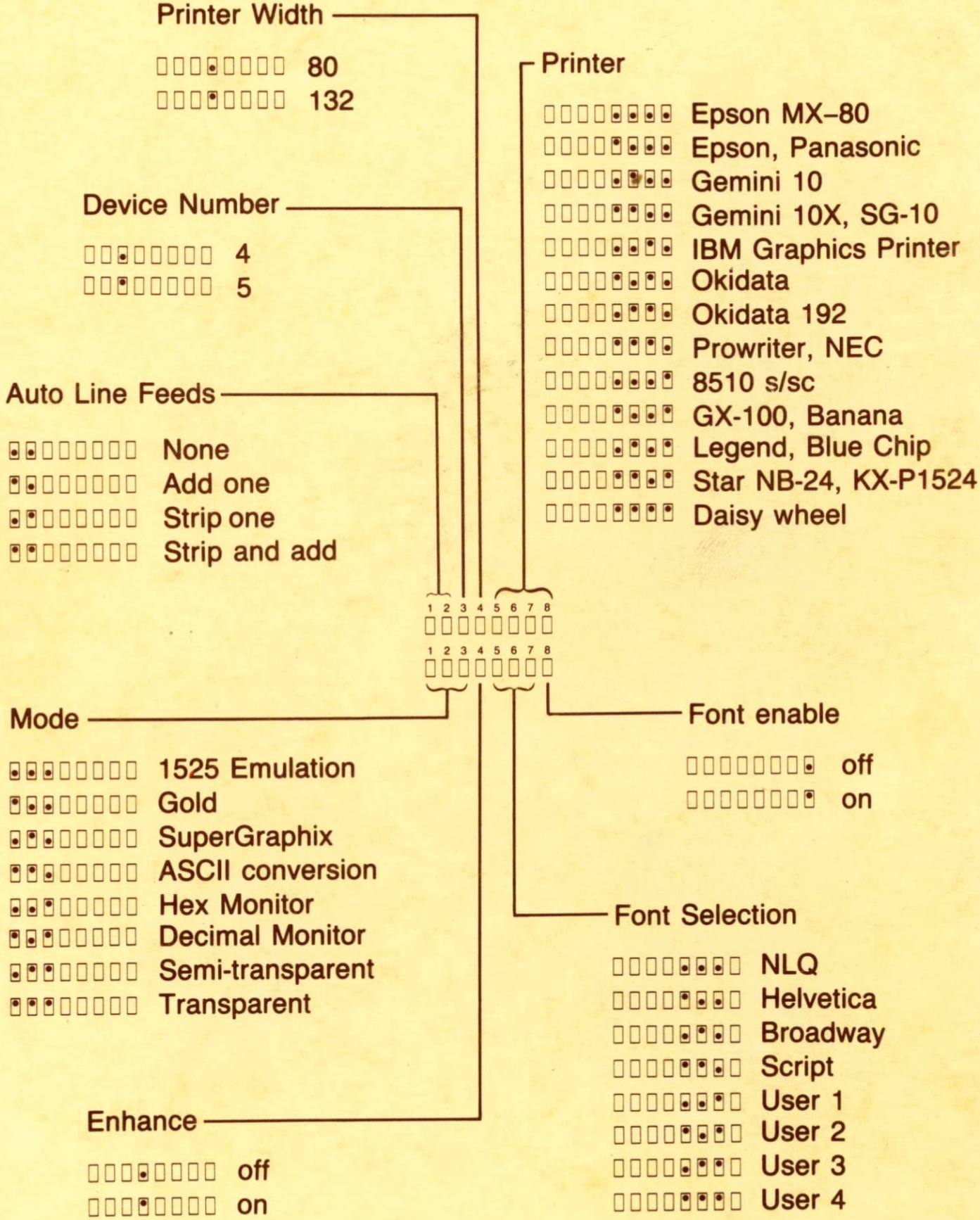
SUPER GRAPHIX GOLD
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